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SURGICAL THERAPY IN GALL-BLADDER DISEASE

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SURGEONS and internists now agree that an infected gall bladder is incapable of restoration to normal function. The degree of disability which a patient suffers as the result of a diseased gall bladder is dependent not so much upon the involvement of the gall-bladder wall as upon a changed content, together with the involvement of pericholecystic structures, *i.e.*, the liver, pancreas, duodenum and common bile duct. It is our opinion that, with extremely few exceptions, gall-bladder disease in any of its phases never demands emergency surgical intervention. Patients suffering any disease in which a surgical procedure is necessary to their recovery must accept operative interference for one of two reasons—first, to save their lives; secondly, to restore their economic and social efficiency. It is in this second group that we place patients suffering from cholecystic disease.

There are three phases of biliary disease with which the surgical consultant must deal: (1) Chronic cholecystitis, with or without stone. (2) Acute cholecystitis. (3) Biliary disease accompanied by jaundice; (a) with an associated acute cholecystitis; (b) jaundice following a long history of chronic cholecystitis—(1) with fever, (2) with no fever; (c) with biliary colic and jaundice, both of extra biliary origin; (d) with jaundice of hepatic origin.

In this discussion we shall confine ourselves to chronic cholecystitis, with or without stone. Having established this diagnosis, the decision as to whether the disability warrants the risk and inconvenience of an operation must rest solely with the patient. The relief which such patients may receive from dietetic measures is probably more definitely an individual factor than in any other disease where dietetic measures are of value. The common basic principle underlying the dietetic régime is the avoidance of fatty, fried, or greasy foods, rich pastry, and certain raw fruits. If the relief obtained by this régime is insufficient to maintain social and economic efficiency then the patient suffering from chronic cholecystitis with or without biliary calculi must accept operation.

The popular discussion, of relatively recent date, regarding the merits of cholecystectomy *vs.* cholecystostomy as an operative procedure is now happily settled. The ideal procedure is a cholecystectomy. The gall bladder, as evidenced by the Graham-Cole dye test and x-ray examination, has lost its ability to concentrate bile, and therefore has lost its usefulness. The deterring factors which would make one choose cholecystostomy as the better procedure are, first, serious involvement of the common duct or pancreas; secondly, a patient whose condition or age only warranted the more minor procedure; thirdly, the inexperience of the operator. The likelihood of technical disaster is greatly reduced when a cholecystostomy is done instead of a cholecystectomy. The decreased risk with the lower mortality compensates for the higher percentage of incomplete cures.

The diagnosis of chronic cholecystitis can now be made with great accuracy. In a recent series of cases analyzed by Dr. C. B. Parker, of the Toronto General Hospital, correlating the combined surgical, x-ray and pathological diagnoses, he found that 94 per cent were accurate. This percentage was determined by the report from the x-ray laboratory of a mal-functioning gall bladder coincident with the report of the pathological department of a chronic cholecystitis in the removed gall bladder.

Despite the accuracy of diagnosis, the percentage of absolute cures following surgical procedures on the biliary tract is only approximately between 80 and 90. There still remains the small group of 10 to 20 per cent in which there are residual symptoms. This residuum of unsatisfactory result falls into three classes. First, a large percentage of these are due to irreparable damage of the bile ducts, liver or pancreas, or mechanical interference with normal motion of the pylorus or duodenum, the result of adhesions following the operative interference. A second class results from the failure of the clinician to realize that the long-continued presence of the cholecystitis has produced a reflex "hair-trigger" mechanism, manifest in abnormal gastro-intestinal motion, which may be demonstrated radiographically by the presence of a prolonged mid-gastric spasm, or intense pylorospasm. The persistence of constipation from which these patients suffer is also a contributing factor in this group. Thirdly, a class in which the surgeon has failed to deal with calculous obstruction in the common bile duct. This third source of failure to obtain relief by operation has been impressed upon us recently.

It is a challenge to the surgical staff to decrease this 10 or 20 per cent of failure and obtain absolute cure. The first cause of failure can be avoided in some instances by gentleness in the operative manipulation, the avoidance of undue trauma, and the re-peritonealization of the gall-bladder bed after removal of the gall bladder. It is true that certain technical conditions arise in which this is impossible, and in addition there is damage to the peritoneal covering of the duodenum. It has been our practice under such conditions to place free omental grafts over the duodenal cap and into the gall-bladder bed. This serves two purposes. First, it is an excellent means of controlling persistent oozing, thereby decreasing the formation of crippling adhesions; secondly, it allows of the formation of a free scar which will not interfere with duodenal motion. If irreparable damage has occurred in the ducts and the pancreas, this might have been avoided by the earlier realization that gall-bladder disease is incurable apart from surgical extirpation. The patients should therefore be advised to submit to operation before the repeated inflammatory attacks involve these structures.

The second class, in which the patient has developed a reflex "hair-trigger" mechanism, as evidenced by abnormal gastric motion, is responsible for the greatest percentage of failures. These patients usually complain of gas, most often associated with the intake of food, and of constipation. If we are content simply to remove the diseased gall bladder and leave the patients to their own resources without an intelligent supervision of the convalescence extending over a period of six to twelve months, we are bound to have a high percentage of incomplete cures. Many of these patients have learned over a period of years that air-swallowing gave them relief. This has become an unconscious habit in which they will persist after operation, with the result that flatulency is unrelieved. Further, the mental depression which is an almost constant accompaniment of a chronic cholecystitis leads such patients to become introspective. Therefore the supervision of the convalescence directed towards a slowing down of their threshold of reaction by means of mild sedatives, continued reassurance of a return to health, belladonna or atropin judiciously administered to relieve spasm, the correction of air-swallowing, the correction of constipation by means of habit, diet and small doses of magnesium sulphate, will, if persisted in over a period of six to twelve months, relieve many of these patients of their residual disability and restore them to perfect comfort.

In the third class, in which common duct stones may inadvertently have been overlooked, we are at the moment greatly interested. This interest has been stimulated from several sources. First, stones have been found in the common duct at autopsy in cases where the patient had not complained of biliary colic, and where jaundice had not been present. Secondly, we have realized the fact that following the removal of the gall bladder stones may be present in the common duct without colic and without jaundice; in fact we are at a loss to explain why biliary colic is possible with calculous obstruction of the common duct following cholecystectomy. Seventy cases were examined by our resident physician, Dr. I. G. McDonald, in conjunction with Dr. Robinson, of the Department of Pathology, to determine the presence of muscle in the common bile duct. In no case did they find a muscular coat in the common bile duct, and only occasionally a few isolated muscle

fibres. Further, in an analysis, of a group of cases with proven stone in the common duct, also by Dr. McDonald, many of these cases showed the absence of both pain and jaundice. In other words, *it is not true that a painless jaundice may not be due to a calculous obstruction of the common bile duct.* The following history is illustrative of this type of case:

> Mrs. –, aged 62, was admitted to hospital with a progressive, painless jaundice lasting over a period of three months. No enlarged gall bladder could be found. The liver was enlarged. At operation there was a congenital absence of the gall bladder, and multiple stones were removed from the common duct, resulting in recovery.

Recently Wilkie has reported an incidence of common-duct calculi associated with chronic cholecystitis which is much higher than has been our experience. This same experience was reported by Lahey at the meeting of the American Surgical Association in Washington in May of this year. Until recently we have been very loath to open the common bile duct unless the indications were extremely definite, and we have in the past opened the duct, found no stone, and at a later date have proved that a stone was present. I am of the opinion that, while stones may form in the common bile duct, yet when they are found in this situation subsequent to the removal of a gall bladder containing stones, it is likely that they were present at the original operation, particularly if they are faceted.

While the series of cases reported here is small, nevertheless it represents an honest study of a small group done by one surgeon over a period of four and a half years. The tremendous change in the incidence of exploration of the common bile duct, and the increased number of common-duct stones removed, with very little change in the number and source of the patients operated upon, has made a great impression.

TABLE I

Incidence of common duct stone

	1929	1930	1931	1932	1933
Total number of cases operated on	34	53	62	51	48
Cholecystectomies	31	41	53	37	35
Cholecystenterostomies	0	2	4	2	3
Cholecystostomies	1	5	0	3	1
Choledochotomies	2	5	4	5	13
Choledochotomy, unnecessary	1	0	1	0	1
" for pancreatitis	0	0	2	3	1
" " proven stone	1	5	1	2	9
" " stricture	0	0	0	0	2

It is interesting to note that in the four and a half years there were 3 instances in which nothing was gained by opening the common duct, and yet there was only one instance of this in 1933. Despite our increased zeal in exploring the common duct by opening it, because we realize that conclusions based solely on palpation are unreliable, there has been a very much smaller percentage of error. To have increased the incidence of common-duct stones by almost 90 per cent over any previous year makes one realize that the only possible conclusion is that in the past we have overlooked their presence. Because of the absence of muscle in the common bile duct, biliary colic is not a constant accompaniment. Realizing also that the common duct may be filled with stones without associated jaundice, the absence of jaundice is no evidence that stones are not present.

In this connection it is interesting to note the relationship of jaundice to the proven presence of stone in the common duct:—

TABLE II

Incidence of jaundice

Number of cases with stones in the common duct	18
No history of jaundice	6-33%
History of jaundice	3
Jaundice present	9
Presence or history of jaundice	66%
In the same period, the number of cases giving a history of or showing the presence of jaundice, with no stone in common duct	31
In 248 cases, jaundice or a history of jaundice elicited in	12.5%
" " " stones present in the common duct	7.9%

In the 248 cases forming the basis of this analysis we found 18 with stones in the common duct. Of these 33 per cent had no history of jaundice; about 15 per cent gave a history of jaundice, and 50 per cent were jaundiced on admission. Thus in this group the presence or history of jaundice is elicited in only 66 per cent. Further, there were 31 cases in which jaundice was present, in which no stone was found in the common duct, the jaundice being due to extra-biliary œdema, either from repeated gall-bladder colics or acute infection of the gall bladder. Thus in this group of cases jaundice or a history of jaundice was elicited in 12.5 per cent. In the same group of cases only 7.9 per cent showed a stone in the common duct. While one realizes the fallacy of percentages in such a small group of cases, it surely is worthy of thought to find that *nearly 40 per cent of the*

patients who come in complaining of jaundice have no stone in the common duct, and, conversely, 33 per cent of the patients who have stones in the common duct have no jaundice or history of ever having had jaundice. The lesson which we have learned is that the presence or absence of jaundice, or a negative finding on palpation of the common bile duct, is very poor evidence upon which to base a diagnosis of the presence or absence of stone in the common bile duct.

We must therefore formulate indications for opening the common bile duct when dealing with a chronic calculous cholecystitis. The following are those which we are following at the moment, if palpation of the common bile duct does not reveal the presence of calculi: (1) where there has been a history of jaundice, or if jaundice was present at the time of the operation; (2) if the wall of the common bile duct is thickened; (3) if the common bile duct is dilated; (4) if the pancreas is enlarged or hard. With these indications followed zealously for the first six months of 1933, of the 48 cases operated upon, stones in the common duct were found in 9, a little over 18 per cent. This is so at variance with our former experience that I feel confident we have found one explanation for our failures to secure a complete cure following operation. We have developed a technique in opening the common bile duct which decreases the danger, either immediately or remotely, from stricture, and, secondly, by using our present procedure, we have found stones which formerly we would have probably been unable to find.

The method of dealing with the common duct

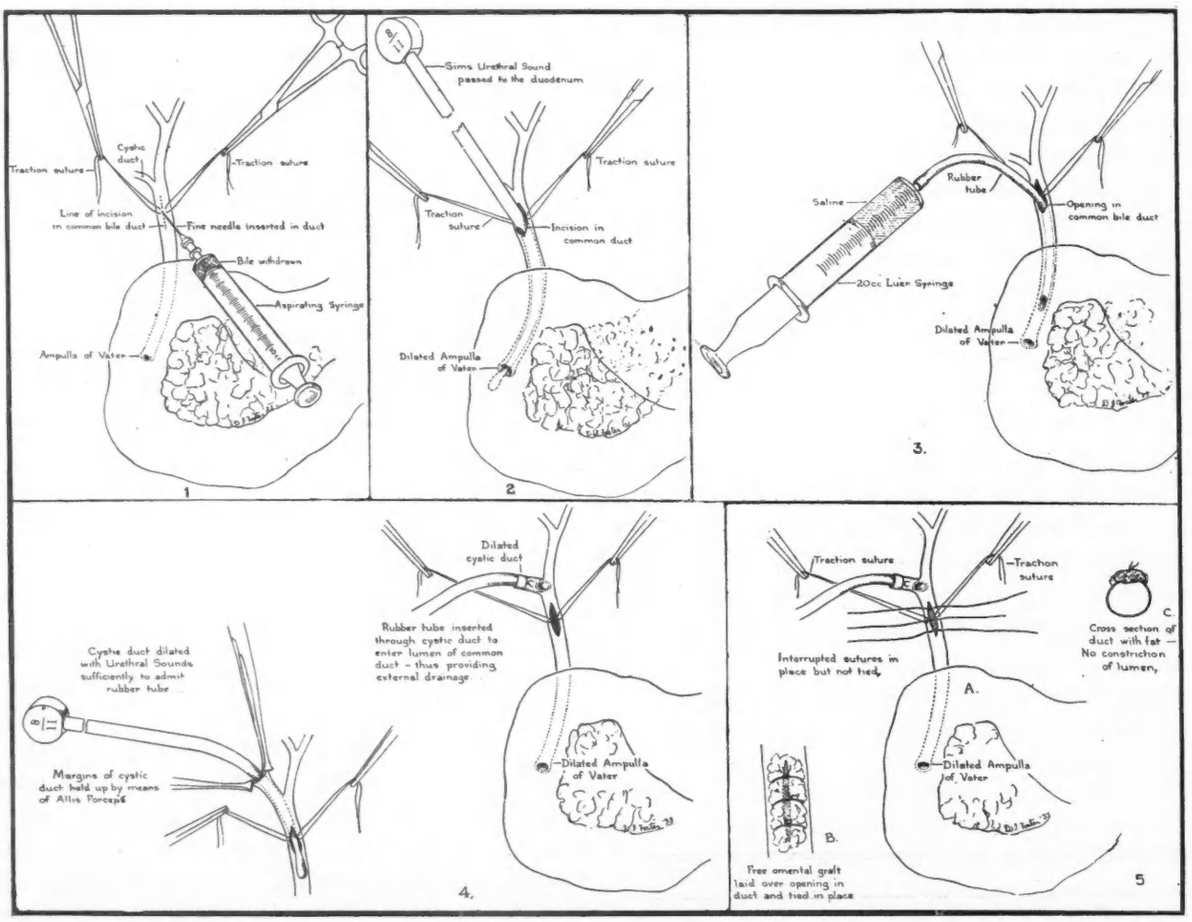

FIG. 1.—Showing method of controlling common duct with stay sutures, and differentiating from portal vein by aspiration.

FIG. 2.—Method of inserting urethral sound to explore common duct and dilate ampulla.

FIG. 3.—Method of flushing out the common duct with saline removes débris and ensures its patency.

FIG. 4.—Shows method of dilating stump of the cystic duct with urethral sound and the position of tube which is tied in the stump of the cystic duct.

FIG. 5.—A shows method of inserting interrupted sutures in the opening of the common duct. B shows sutures tied over a free omental graft. C illustrates incision in common duct closed without any constriction of the lumen.

itself is based on a procedure which we have followed for some years in dealing with the ureter and kidney pelvis. By using a gastro-intestinal suture on a swedged needle, two traction sutures are put in the common bile duct placed sufficiently far apart to allow the duct to be incised between them. Before incising the duct we take the precaution of inserting a fine hypodermic needle on a syringe into the supposed duct and confirming the accuracy of our anatomical dissection by the withdrawal of bile (Fig. 1). This avoids injury to the portal vein. In exploring the common bile duct we adopted the suggestion of Professor Wilkie, of Edinburgh, to use Sims' graduated urethral sounds. With these instruments it is possible to be absolutely certain of the position of the point, and by their use the opening of the common bile duct into the duodenum can be gradually dilated. Even though we are able to dilate the opening of the common bile duct into the duodenum up to a No. 10, English, we are yet not certain that no stone is present (Fig. 2). We then introduce a rubber tube, to which is attached a Luer syringe filled with saline, directed towards the duodenal end of the common duct (Fig. 3). If, on forcing the saline into the rubber tube, it flows readily back through the opening in the common duct, we can be almost certain that there is a ball-valve calculus present. With a sound again in position, and on careful palpation, it will be possible to feel it. Occasionally it may be pushed into the duodenum through the dilated ampulla of Vater. Certainty that this eventuality has occurred is confirmed by the fact that saline introduced by means of a rubber tube into the common duct with fair rapidity flows readily into the duodenum without any reflux through the opening in the common bile duct. The common duct, proximal to the opening, is then washed out in a similar manner, and stones and débris are thus removed. This technique is simple, safe and not time-consuming.

After the exploration of the duct is finished, instead of attempting to close the opening by either multiple interrupted sutures or by continuous suture, a free omental graft is placed over the opening, which, if it has not been of necessity very large, is simply held in place by tying the two stay sutures over it, and nothing more. If, on the other hand, there has been an unusually long opening, one or two sutures are passed through either side of the opening in the duct and then loosely tied over the omental graft. In this way there is no possibility of stenosing the duct by our procedure, and the freedom from leaks which we have experienced in dealing with the ureter and kidney pelvis by this means has been duplicated in dealing with the common duct (Fig. 5). There is no necessity whatever for establishing direct drainage of the common bile duct from which stones have been removed, unless we are dealing with infection, as evidenced by fever and leucocytosis. We do, however, provide for safety-valve drainage by means of isolating the cystic duct and leaving a stump one-half or three-quarters of an inch long, which, following dilatation by means of urethral sounds, permits the introduction of a tube which lowers the bile pressure in the common bile duct until healing occurs.

CONCLUSIONS

1. Three groups of biliary disease requiring surgical therapy are described.

2. Failure to obtain a complete cure following operation on patients who suffer from chronic cholecystitis is due to three factors: (a) irreparable scarring from infection or trauma; (b) persistence of gastric and pyloric spasm; (c) failure to remove stones from the common bile duct.

3. Indications which necessitated opening the common bile duct are enunciated.

4. A small series is reported in which, with diligent searching, the incidence of stones in the common bile duct associated with chronic calculous cholecystitis reaches 18 per cent.

5. A method for opening, exploring and closing the common bile duct is advanced.

HOT-WATER BOTTLE BURNS DURING BASAL NARCOSIS.—Since avertin and the other so-called basal narcotics have come into such general use before anæsthesia, a word of warning appears to be necessary in the use of hot-water bottles during the long sleep which follows the use of these drugs. It is this prolonged sleep, low blood pressure, and the appearance of low vitality with, perhaps, a chilly feel, which tempts nurses, quite naturally, to put hot-water bottles in the beds of these patients. Under no conditions should this be allowed, as these people are particularly prone to burns, even though the bottle is only just warm, covered, and used outside blankets. A hot-water bottle is a potential danger after any anæsthetic, but becomes an actual danger after the use of basal narcotics, and should be rigidly prohibited.—Z. Mennell, in *Brit. M. J.*, 1933 **2:** 1095.

A DISCUSSION OF THE FACTORS CONCERNED IN INTRA-OCULAR ABSORPTION

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IT is common to find rapid and complete absorption of opaque lens protein when it is in contact with the aqueous fluid. The complete disappearance of congenital cataract following discission, the disappearance of opaque lens protein caught in the fibres of a post-operative pupillary membrane, and the absorption of lens material found in the anterior chamber following certain operations and perforating injuries of the eye with rupture of the lens capsule, are common clinical experiences. When absorption occurs the pupil is again unobstructed and vision is restored. Unfortunately this is by no means a constant occurrence. The extent to which absorption occurs and the rapidity of the reaction varies with the individual concerned. The younger the person, the more rapid and complete is the reaction. In older people and those in poor general health the process is slow, and often either incomplete or it does not occur at all.

A comprehensive view of this reaction, as it is undoubtedly a biochemical change, involves a knowledge of the chemical composition of the intra-ocular fluids and the crystalline lens. Within the past few years much has been accomplished in this field; new and valuable information has been gained. This has been a tedious and difficult task involving complicated micro-chemical methods. Much praise is due to such workers as Duke Elder, P. W. Salit, Rados and others for their efforts. With a knowledge of the micro-chemical structure of the crystalline lens and the aqueous humour and also the vitreous, we have presented to us a wider and entirely new conception of such intra-ocular diseases as cataract, vitreous opacities and glaucoma. The old and established teaching that the aqueous was secreted entirely from the ciliary bodies is now a matter of divided opinion. In the light of new knowledge we find that the aqueous may be mostly the product of dialysis between the blood capillaries on the one hand and the avascular intra-ocular tissues on the other, and that in order to preserve transparent refractive media a very fine biochemical balance must be maintained. It is, however, outside the scope of this paper to enter into a discussion of the theories of aqueous formation or of avascular tissue nutrition, except in so far as they may have a definite bearing on the question of absorption.

It has long been recognized that autolytic processes in the body were enzymatic in nature, and that the enzymes chiefly concerned were those of the leukocytes and lymphocytes. It has also been determined that there is an enzyme adsorbed on the globulin fraction of the serum which digests protein in acid media. Detailed studies of these enzymes have been made by Opie[1] and Bradley.[2] In dealing with the absorption of the proteins of the crystalline lens we must bear in mind that it is an avascular structure, and that *in vivo* it depends entirely upon the dialysis of its food products through its capsule, and also that it has a very highly developed auto-oxidative system. It is logical to expect that the usual blood-carried enzymes are present in the intra-ocular fluids only under very special circumstances and to a very limited degree. In fact under normal conditions there are very few white cells in the aqueous humour, the average in the rabbit being 217 per c.mm. If, however, an intra-ocular leukocytosis does occur and the lens protein comes in contact with these cells we find fractionation taking place, and the eye, if it recovers, is aphakic. Globuloprotease would be present in the aqueous, as this enzyme is adsorbed on the complex colloidal surfaces of the globulin fraction of the serum. Globulin is present in the aqueous, as has been shown by Duke Elder,[3] in horse aqueous to the extent of 12.3 mg. per 100 c.c. of aqueous.

It is not only necessary that these enzymes be present in order that absorption should occur but that their surroundings be such that they

are capable of producing digestion. There is, evidently, in the albumin fraction of the serum and also in the albumin of the aqueous and lens some substance which inhibits the enzymatic reaction. It is also necessary that the hydrogen-ion concentration be such that they may function at their optimum capacities. In order to learn something of the action of these enzymes on lens protein the following experiments were undertaken.

In all cases fresh pig lens was used. Cubes of lens were cut about 4 m.m. square, and one cube placed in each test tube. The solution containing the enzyme was added in fixed quantities and each tube adjusted to a definite pH by the addition of 5 c.c. of buffer solution. Digestion was allowed to proceed for 48 hours at 37° C. and the amount of digestion in each tube then determined.

Since there is no chemical or colorimetric test for the presence or absence of an enzyme, micro-Kjeldhal estimations of the protein-free nitrogen present in the digests at the end of the 48 hour period were made. As the varying amounts of amino-acids produced by the protein fractionation are proportional to the amounts of nitrogen set free we have by estimating the non-protein nitrogen in our digests at the end of a given time a standard by which we can determine the amount of digestion which has taken place under the varying conditions created in our tubes. Micro-Kjeldhal nitrogen estimations were therefore done on each digest and after nesslerization colorimetric readings made giving the determinations in mg. of nitrogen per c.c. of digest. In all cases each tube was tested for contamination. If contamination occurred the experiment was repeated.

Leukoprotease.—The production of leukoprotease was accomplished by the injection of a mixture of aleuronat meal, starch, and water into the pleural cavity of a dog. After a period of four days the animal was anæsthetized and killed. The chest was opened under sterile conditions. A large cellular exudate was found in each case, usually of a pinkish grey colour, more red at times than others because of varying amounts of red cells. Smears were made from these cells and it was found that white cells of the small polymorphonuclear type predominated.

The exudate was centrifuged and the cells washed three times in 0.85 per cent saline. The cells were then placed in sterile flasks and allowed to autolyze at 37° C. for twenty-four hours. Cultures were taken from the autolysate to insure its sterility. The volume of the cells was then measured. The autolysate was then treated with 5 to 6 times its volume of alcohol 2 parts and ether 1 part, and allowed to stand for twenty-four hours. It was then put through a porcelain filter and allowed to evaporate. The resulting sticky brown crystalline mass was weighed and this used as the enzyme preparation.

EXPERIMENT I.—Digestion allowed to proceed for 48 hours.

Tube	*pH (buffer sol.)*	*Protein surface exposed*	*Leukoprotease*	*Amt. diges. in mg. N. per 5 c.c. of digest.*
1.	5.8 (5 c.c.)	¼ fresh pig lens	1/16 g.	2.97 mg.
2.	6.0 "	¼ " " "	1/16 "	2.19 "
3.	6.2 "	¼ " " "	1/16 "	5.88 "
4.	6.4 "	¼ " " "	1/16 "	5.03 "
5.	6.6 "	¼ " " "	1/16 "	5.45 "
6.	6.8 "	¼ " " "	1/16 "	6.66 "
7.	7.2 "	¼ " " "	1/16 "	7.14 "
8.	7.4 "	¼ " " "	1/16 "	6.82 "

A set of control tubes was set up with this experiment, 8 tubes being used, exactly the same as the above but without the enzyme present. No digestion occurred in the 48 hours.

The greatest amount of digestion occurred in tube 7 with a pH of 7.2. After repeating this experiment a number of times the same results were obtained. We therefore conclude that 7.2 is the optimum pH for this leukoprotease.

Lymphoprotease.—The production of this enzyme which is an extraction from the large mononuclear lymphocytes was accomplished in the same way as with leukoprotease, the only difference being in the length of time which the chest condition was allowed to run, *i.e.*, the animal was killed on the seventh or eighth day of the disease rather than on the fourth.

Globulo-protease.—In order to procure a sufficient quantity of this enzyme it was necessary to use ox blood. Two gallons of whole blood was allowed to clot and the serum decanted. The

globulin was fractionated by precipitation by saturation with $MgSo_4$, filtered, and the precipitate dialyzed for twenty-four hours. It was then treated with alcohol and ether and subjected to the same extraction process as used for the production of leukoprotease.

EXPERIMENT 5

This experiment was undertaken to prove the existence of an enzyme in the aqueous and also to compare the enzymatic activity of the young and the old aqueous.

A normal adult rabbit lens was extracted under aseptic conditions and cut in equal parts, one-half lens being placed in each of two tubes. To one tube was added 1 c.c. of adult rabbit aqueous, to the other 1 c.c. of young rabbit aqueous.

EXPERIMENT 2.—Digestion allowed to proceed for 48 hours.

Tube	*pH (buffer sol.)*	*Protein*	*Lymphoprotease*	*Amt. diges. in mg. N. per 5 c.c. of digest.*
1.	5.8 (5 c.c.)	¼ fresh pig lens	1/16 g.	1.40 mg.
2.	6.0 "	¼ " " "	1/16 "	1.51 "
3.	6.2 "	¼ " " "	1/16 "	1.61 "
4.	6.4 "	¼ " " "	1/16 "	2.72 "
5.	6.6 "	¼ " " "	1/16 "	2.00 "
6.	6.8 "	¼ " " "	1/16 "	1.93 "
7.	7.2 "	¼ " " "	1/16 "	1.35 "
8.	7.4 "	¼ " " "	1/16 "	0.01 "

Controls for this set showed no digestion in the 48 hour period.

The greatest amount of digestion occurred on the acid side of neutrality, namely, in tube 4 with a pH of 6.4. The amount of digestion was very considerably less than when leukoprotease was used. The fact that this enzyme works best in a slightly acid medium is in accordance with the findings of previous workers. It does not fractionate lens protein, in the unchanged state, as rapidly as the enzyme of the small mononuclear leukocytes.

EXPERIMENT 3.—Digestion allowed to proceed for 48 hours.

Tube	*pH (buffer sol.)*	*Protein*	*Globuloprotease*	*Amt. diges. in mg. N. per 5 c.c. of digest.**
1.	5.8 (5 c.c.)	¼ fresh pig lens	1/16 g.	0.85 mg.
2.	6.0 "	¼ " " "	1/16 "	1.00 "
3.	6.2 "	¼ " " "	1/16 "	1.71 "
4.	6.4 "	¼ " " "	1/16 "	2.91 "
5.	6.6 "	¼ " " "	1/16 "	6.97 "
6.	6.8 "	¼ " " "	1/16 "	1.46 "
7.	7.2 "	¼ " " "	1/16 "	1.20 "
8.	7.4 "	¼ " " "	1/16 "	1.37 "

Controls for this set showed no digestion. The optimum pH for this globuloprotease is evidently 6.6.

* These figures all represent the calculations and not the colorimeter readings.

The effect of albumin in the digests.—

EXPERIMENT 4.—Digestion time 48 hours.

Tube	*Buffer*	*Enzyme*	*Protein*	*Albumin*	*Mg. N.*
1.	5 c.c.	7.2 leukoprotease	¼ pig lens	1/16 g.	2.30
2.	"	6.4 lymphoprotease	"	"	1.92
3.	"	6.6 globuloprotease	"	"	3.33

In all three cases the presence of the albumin fraction of the serum inhibited the action of the enzyme as will be seen if the above figures are compared with those found at the same pH in Experiments 1, 2 and 3.

As can be seen from the figures of Experiments 1, 2 and 3, leukoprotease seems to be the most efficient fractionator of lens protein. Globuloprotease seemed to be fairly efficient, but must have an acid pH. Lymphoprotease was the least active enzyme and also required an acid pH.

Nitrogen estimations were done by the Kjeldhal method on the fresh aqueous immediately after withdrawal, and again after the digestion was allowed to proceed at 37° C. for 48 hours.

It was found during the course of this experiment that the average non-protein nitrogen of the adult rabbit aqueous was 0.177 mg. per c.c. of fluid, and that the average for the young aqueous was 0.250 mg. per c.c.

Adult aqueous:

Before digestion non-protein nitrogen .. 0.177 mg.
After digestion non-protein nitrogen ... 0.240 "

Therefore the amount of digestion of lens protein equals the difference between these two figures, or 0.063 mg.

Young aqueous:

Before digestion non-protein nitrogen .. 0.203 mg.
After digestion non-protein nitrogen ... 0.307 "

The amount of lens protein digestion then is 0.104 mg.

This represents an increase of 65 per cent in the amount of digestion by the aqueous of the young animal when acting upon the same lens protein.

When we allowed the controls to run for ten days we found that a slight amount of digestion occurs, *e.g.*, 1.20 mg. of nitrogen. There is then an interstitial lens enzyme but it is in such a low concentration that, provided it is free to act, a long period of time must elapse before any appreciable amount of digestion will occur.

The above result proves first, that there is an enzyme in the aqueous, and secondly, that there is more enzyme in the young than in the old. If the experiment had been allowed to proceed for a longer period of time the amount of digestion would probably have been the same, because the concentration of the enzyme in a digest influences the velocity of the reaction only.

DISCUSSION

Since we found no digestion occurring in our control tubes up to the end of the 48 hour period we are justified in assuming that the digestion recorded was due to the enzymes added. Enzymes are not easily dialyzable and consequently we could not expect to find them passing through the lens capsule very freely, from the aqueous, nor, for that matter, from the blood to the aqueous. Therefore softening of cataractous lens material in the capsule is of necessity a long and tedious process.[4] This is borne out in clinical experience, *e.g.*, the "over-ripe" cataract. Cases are on record noting complete disappearance of cataractous lens material without artificial interference, but the process extended over many years.

Varying amounts of albumin in the lens and aqueous of different patients will have an inhibiting action on the absorption of lens protein *in vivo*, the velocity of the reaction varying inversely as the amount of albumin present, but in accordance with the accepted theories of enzyme action this factor will exert itself only up to a certain point, *i.e.*, the albumin has an inhibiting effect but does not stop the reaction entirely.

With an increase in age there is a corresponding increase in the alkalinity of the aqueous.[5] In the young the pH approximates 7.23 and at two years approaches 7.40, later on it is still higher; thus as age increases the pH of the aqueous draws further and further from the optimum for any of the blood carried enzymes.

CONCLUSION

It is interesting to note that in the young the pH of the aqueous is at the optimum for leukoprotease, as found in our experiments. This combined with the increase in the concentration of enzyme in the young aqueous should produce a rapid and complete absorption of cataractous lens protein. Clinical experience proves this to be so. Here then is an explanation of the rapid and complete absorption of cataractous material following needling of congenital cataract in the young patient.

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AN EARLY SYMPTOM OF VARICELLA.—O. Lade (*Münch. med. Woch.*, August 4, 1933, p. 1215) remarks that although varicella is usually harmless the admission of cases to hospital may disorganize the work of an entire department, and that it is desirable that some early symptom of infection should be discovered before the eruption appears. He claims to have found in many cases a prodromal symptom which has hitherto escaped attention—namely, a peculiar diarrhœa or very soft stool occurring precisely fourteen days prior to the eruption. Any child unaccustomed to diarrhœa who passes such a stool should be isolated immediately. Lade has verified this observation in a large number of cases in children's homes during a period of several years, and has been able to predict in many cases the exact date of the appearance of the eruption. The question of the mode of invasion of the infection of varicella is still uncertain, but this prodromal diarrhœa appears to incriminate the intestinal tract. The diarrhœa may be due to the primary toxic action, while the eruption is evidence of the systemic effect of the infection. The author suggests that further observations on this point may not only assist in the early diagnosis of varicella, but, as prodromal diarrhœa does not occur in varioloid, may throw light on the occasionally difficult differential diagnosis between this disease and varicella.—Abs. in *Brit. M. J.*

DINITROPHENOL*

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FOR practical clinical purposes desiccated thyroid gland is, as yet, the most reliable accelerator of metabolism, when the purpose is not only to increase the metabolic rate but to maintain it at a raised level. The reliability of the desiccated product has been greatly enhanced by improvement in the method of standardization. Thyroxine is now readily separated from physiologically inactive iodine-containing compounds of the thyroid gland, and thus affords fairly accurate assay of therapeutic preparations. The experimental error of standardization is about 15 to 20 per cent,[1] compared with 1000 per cent or more by past methods. *A priori* one would expect that thyroxine would be a more reliable product. It is a pure substance; therefore, actual and anticipated response to a given dose should approximate each other very closely. It is, however, a well recognized fact that when administered by mouth its action is irregular; its effects are quantitative only when it is injected. This phenomenon is remarkable in view of the fact that it has been shown that the action of thyroid preparations given by mouth is roughly proportional to the thyroxine content.[2] Destruction of thyroxine by intestinal enzymes has been suggested as a possible explanation.[3] This appears unlikely in view of the effectiveness of gland substance. A more plausible explanation, suggested by Ashley and Harington,[4] is that, as chemically pure thyroxine is extremely insoluble in the free condition, it is absorbed from the intestinal tract with great difficulty. These authors suggest that thyroxine probably exists in the gland in combination with a peptide or a protein—a compound readily soluble in water. This suggestion is based upon the drastic hydrolysis necessary before thyroxine can be isolated. The effectiveness of whole gland is thus probably due to absorption of a soluble compound of thyroxine or of thyroxine alone liberated by digestion in a physical condition which favours its absorption. Gaddum and Hetherington[2] also suggested that the variations in effect noted were probably due to thyroxine differently combined in the different preparations.

Recently, Anderson, Harington and Lyon[5] have shown that a closely allied substance, namely, 3:5 diiodothyronine, is not only capable of increasing metabolism but also relieves the symptoms of myxœdema. Electrocardiographic records afforded further proof of its effectiveness. This compound is much more soluble than thyroxine, and is, therefore, effective when given by mouth. The discovery of this compound is not new. In 1928, Ashley and Harington in a study of some derivatives of thyroxine described its preparation and properties.[4] The discovery, however, was then regarded as of little physiological interest. Diiodothyronine is readily prepared and stable—valuable attributes. As an accelerator of metabolism it is less potent than thyroxine. In animals, Gaddum[6] found that its effects on oxygen consumption were indistinguishable from those obtained with thyroxine, but to obtain comparable effects much larger quantities had to be used. This agrees with experiences in man; to relieve the symptoms of a high grade of myxœdema, Anderson, Harington and Lyon[5] found that 50 to 75 milligrams were required daily. Toxic symptoms have never been observed. Chemically, as Gaddum put it,[6] 3:5 diiodothyronine may be represented as thyroxine deprived of two of its atoms of iodine. It appears, however, that 3:5 diiodothyronine does not owe its activity to its being converted by the thyroid gland into thyroxine; the effects noted were the same in the thyroidectomized and normal rat.

Thyroid medication is a specific for myxœdema and is used extensively in the treatment of obesity. In the latter, with very few exceptions, its purpose is merely to accelerate metabolism. Except in endogenous obesity, it is doubtful whether it serves any other purpose, at least in the majority of cases.

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* From the Medical Services of Drs. C. P. Howard and A. H. Gordon, and the Department of Metabolism, Montreal General Hospital, Montreal.

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A disadvantage of thyroid medication is its possible harmful effects upon the heart, unless dosage is carefully controlled. Whether this also applies in 3:5 diiodothyronine is not as yet known. An accelerator of metabolism with no such effects would therefore be of great advantage. Recently, attention has been drawn to the nitrophenols and allied compounds.

That some nitrophenols profoundly affect metabolism has been known for many years. During the Great War, when some of these compounds were used in the manufacture of explosives, attention was again drawn to their effects on metabolism. One of these, 2:4 dinitrophenol, was found to be particularly toxic. Exposure to its vapours led to rapid death, preceded by nausea, vomiting, severe headache and fever. More recently, in Heyman's laboratory, van Uytvanck[7] showed that a closely allied compound, dinitronaphthol, was capable of increasing metabolism. Since then, a number of reports have appeared describing the effects of such compounds. Recently[8] Tainter and Cutting reviewed some of the literature and reported their own experiences with dinitrophenol. Briefly, 2:4 dinitrophenol when administered to animal or man causes a rapid increase of metabolism, and, in large doses, is capable of producing fever. The effects noted were the same for all species of animals studied. With large doses, in animals, death was found to result from circulatory failure, hyperpyrexia, or acidosis and anoxæmia, according to the amount given and the mode of administration. In the human subject as little as 5 milligrams per kilogram given subcutaneously or by mouth was capable of producing slight fever. The onset and duration of the febrile response resembled very closely that observed in animals. Stimulation of respiration is a prominent feature, even without fever.

In view of the fact that dinitrophenol was found to increase the rate of utilization of carbohydrates, its effects upon depancreatized dogs were studied.[9] The drug appeared to be particularly toxic; the animals died before the usual febrile and respiratory response. Insulin counteracted the toxicity to some extent.

In a preliminary communication, Cutting, Mehrtens and Tainter[10] reported that 2:4 dinitrophenol can be used for therapeutic purposes. With small daily doses 3 to 5 milligrams per kilogram) metabolism was maintained as much as 40 per cent above the normal for weeks, with apparently no harmful effects. The action was found to be transient; when the drug was discontinued the rate fell to normal by the third or fourth day. Given orally or subcutaneously, there was no change in pulse rate, even after two months' daily administration. In obesity, oral administration in daily doses of about 3 milligrams per kilogram resulted in a steady reduction of weight, without resort to dietary restriction. Possible dangers were stressed. The use of the drug was then regarded as an experimental procedure. In a more recent paper[11] Tainter and his co-workers reported their experiences with 113 cases of obesity. With an average daily dose of 0.3 grams of sodium dinitrophenol the average loss of weight was 2 to 3 pounds weekly. With continuous administration of the drug for as long as four months toxic effects were observed in a few cases only; of 97 cases under constant observation the drug had to be discontinued in 9. An urticaria-like skin rash was a common manifestation of toxicity. When the drug was discontinued in such cases the rash disappeared without sequelæ. Cystitis, loss of taste and gastro-enteritis were other signs of toxicity. Hypertension and albuminuria associated with obesity were improved in a number of cases. Providing the amount given is not sufficient to produce fever, the drug is apparently harmless.

Recently, Dodds, Pope and Robertson[12, 13] reported their findings with a somewhat similar compound, 4:6 dinitro-o-cresol. This was also found to increase metabolism and was found to be about five times as potent as 2:4 dinitrophenol. Toxic symptoms were noted when the basal metabolic rate was increased above +50. These included severe headache, lethargy, sweating, loss of appetite, and pigmentation of the conjunctivæ. The latter were of a greenish-yellow hue not unlike that of early jaundice, but the blood and urine showed no bile pigments. In a later report[14] Dodds and Robertson showed that, though it increases metabolism, 4:6 dinitro-o-cresol is of no value in alleviating the symptoms of myxœdema. The authors warn that "under no circumstances should the compound be administered in such quantities as to raise the basal metabolic rate above +50, as otherwise grave discomfort and danger will result."

The purpose of the following brief report is to further emphasize the care necessary with the

use of such drugs. From our limited experience with one of them, 2:4 dinitrophenol, it is obvious that such therapy should, as yet, be confined to hospital practice where, with well equipped laboratories and properly conducted experiments its effects can be thoroughly investigated.

In Chart 1 are graphically recorded a number of metabolism time-curves obtained following the oral administration of dinitrophenol. In each test the subject was kept in bed for at least 15 hours beforehand and until all observations were completed. No food was given for 15 hours before the administration of the drug, and none until after the test was completed.* It will be observed that in two tests (curves 4 and 5) an increase of metabolism as much as 50 per cent above the basal level was noted as early as two hours after administration of the drug. That the response is not uniform is shown by comparing curves 2 and 5. In the latter, the peak (maximum increase of metabolism) was reached at the end of two hours; whereas in curve 2 the metabolism was still increasing at the end of six hours. Both curves were obtained on the same person with the same amount of drug (3 milligrams per kilogram).

The difficulty of standardization of oral dosage is further shown in Chart 2. (Reproduction of curves 3 and 4 from Chart 1). Here are graphically recorded the effects of the same amount of drug (3 milligrams per kilogram) in the same individual on two different days, but with the same initial basal metabolic rate. It will be observed that in the first test the metabolism increased from +7 to + 62 per cent; whereas in the second test it increased from +7 to +45 per cent. Here, also, it will be noted that the peak was reached at different times in the two tests. Recovery was also different; in one test, at the end of 24 hours, the basal metabolism had returned to its original level, namely, +7 per cent, whereas in the other it was still increased, namely, +28 per cent.

In patients injected with dinitrophenol in sub-febrile doses, Tainter and Cutting found no change in pulse rate. Dodds and Robertson noted the same phenomenon with dinitro-o-cresol. This phenomenon is strikingly shown in Chart 3. It will be observed that though the basal metabolism increased from –14 to +23 per cent, the pulse rate remained remarkably constant. This patient was an ideal subject on whom to demonstrate this phenomenon, as there were no psychic disturbances due to the tests. This man has been under observation for myxœdema in this hospital since 1921 and had been subjected since then to 231 basal metabolic rate determinations.

Absence of relationship between pulse and metabolic rate is again shown in Chart 4. During this test electrocardiographic tracings were made every hour. The heart (pulse) rate data were obtained from the electrocardiographic

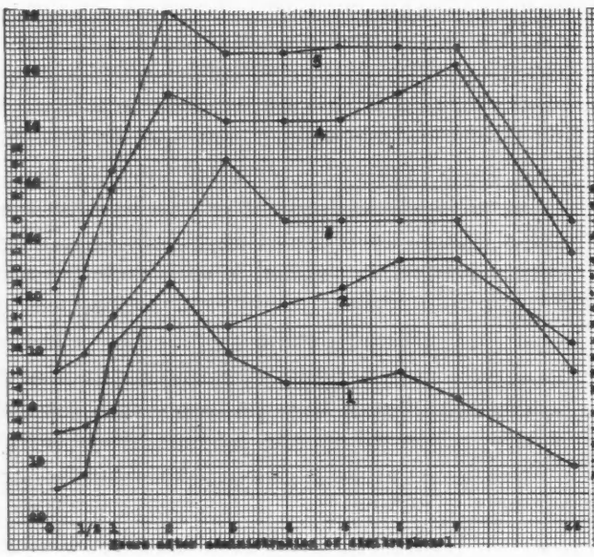

CHART 1.—Basal metabolic rate time curves following administration of dinitrophenol.

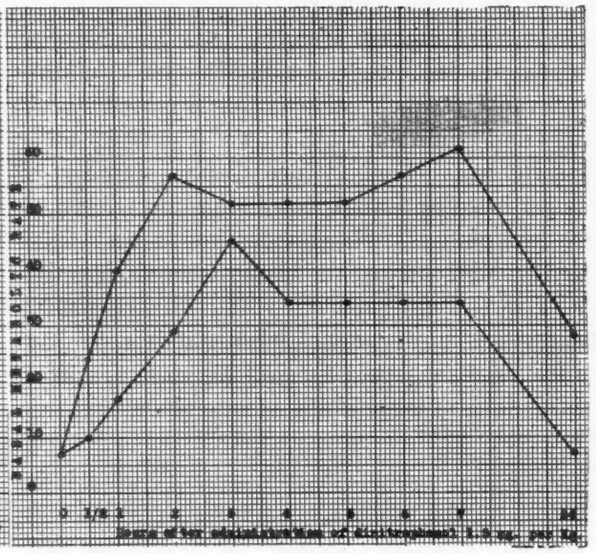

CHART 2.—Showing absence of uniformity in response to same amount of dinitrophenol.

* Sips of water only were allowed after each metabolic rate determination. It was felt that the disturbance of metabolism due to this practice would be much less than that produced by discomfort due to thirst.

records. By increasing metabolism without correspondingly increasing pulse rate, these drugs —dinitrophenol and dinitro-o-cresol—differ from other known accelerators of metabolism—caffeine, camphor, adrenalin, etc. Throughout the series of tests in this experiment the electrocardiographic records were consistent as to rate, contour and amplitude of the deflections. What small changes there were can be explained by rotation of the heart from varying heights of the diaphragm. The only abnormalities noted were in the QRS complexes. The QRS intervals measured between 0.09 and 0.10 seconds—rather long for the age of the patient (33). At this age, or under, they are usually 0.08 or less, provided the galvanometer used has a sufficiently rapid deflection time.*

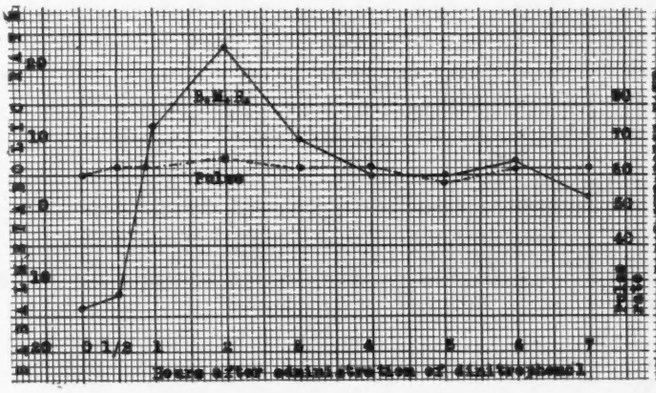

CHART 3.—Showing absence of relationship between pulse rate and basal metabolic rate.

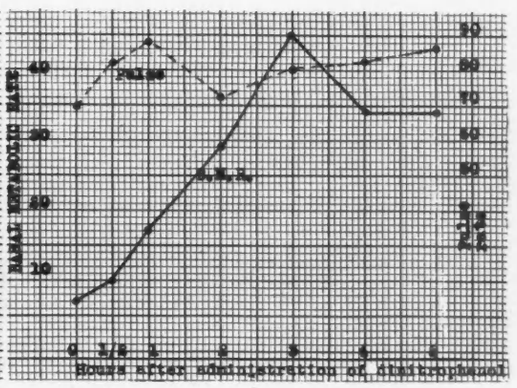

CHART 4.—Showing absence of relationship between pulse rate and basal metabolic rate.

The above data suggest some abnormality of the cardio-vascular system, but are not conclusive. Tainter and Cutting[8] found that dinitrophenol had no selective action on the circulatory system in animal or man, at least as far as blood pressure and heart rate were concerned. Data on cardiac output, by the Fick method, showed a considerable output of blood per minute. The data of Charts 3 and 4 are, therefore, of interest here.

An increase of metabolism implies an increase of oxygen consumption. Without a corresponding increase of pulse (heart) rate one would *a priori* expect an increase of unsaturation of blood, providing that there was no corresponding increase of output of the heart per beat. Tainter and Cutting state they found a considerable increase in volume output of blood per minute.

The measurement of output of the heart in man is very difficult. This is shown by the many methods which have been attempted. In our metabolic work, *relative* instead of absolute output has been used for some time[15] as a measure of circulation. This method has been found reasonably reliable, when strict attention is paid to details. It is simple and the data obtained with it fit in with all known procedures. This method of estimating circulation rate has been criticized largely because of the assumption by some workers that the oxygen content of venous blood from the arm is identical with the oxygen content of the blood in the right side of the heart; and also because of the vagaries of venous blood in the arm. When one of the writers first used this method[15] is was clearly stated that the method was regarded as a *relative* measure of circulation; that when proper precautions are taken the value of the found circulation rate bears the same relation to the true circulation rate that the oxygen content of the venous arm blood bears to the oxygen content of the venous blood entering the lungs. The absolute value may be expressed as the product of the relative value and a constant. With regard to the reliability of venous blood from the arm, it was shown that, under the conditions described, the values are remarkably constant in the same individual. The necessary precautions are as follows. The subject must be kept in a room with a fairly uniform and comfortable temperature. The arm must be made very comfortable and kept so with the aid of cushions for at least 30 minutes before the collection of blood. The subject must be under constant observation to ensure no body movements, especially of the

* The writers are indebted to Dr. C. C. Birchard, Director of the Department of Electro-Cardiography, for his cooperation in this investigation and the interpretation of data.

arm and fingers. No arm band or stasis of any kind must be used prior to or during the collection of blood.

In the following tests it was assumed that the arterial blood was 95 per cent saturated. As neither heart or lung disease complicated the problem (obesity was the only complaint), this assumption was reasonable. Arterial puncture was thus avoided. The oxygen content of the arterial blood was taken as 95 per cent of the oxygen capacity of the venous blood. The combined data are shown in Table I.

It will be observed that in one test (Exp. 2) with increase of metabolism and no corresponding increase of pulse rate the output of the heart per beat was apparently increased; while in the other (Exp. 1) it appeared to be definitely diminished. It is obvious, therefore, that this phase of the metabolism of dinitrophenol requires further study.

As with dinitro-o-cresol, and differing from thyroid gland, thyroxine and diiodothyronine, dinitrophenol does not appear to alleviate the symptoms of myxœdema. This drug was tried in the above-mentioned case. There were all the typical features of the disease, in addition to a marked pericardial effusion. (1,600 c.c. of fluid were removed at one time and 1,800 c.c. at another). The values of two plasma cholesterol determinations were 0.211 and 0.238 per cent. Though dinitrophenol raised the basal metabolism from –32 per cent to as high as +24 per cent and the increase of metabolism was accompanied by loss of weight, the clinical features of myxœdema were not affected. Ten days following the institution of dinitrophenol the plasma cholesterol was 0.244 per cent. This fits with the observations of Tainter *et al.*[11] on the effects of dinitrophenol on cholesterol metabolism and tadpole metamorphosis.

In the above case, incidentally, other phenomena were observed. Albuminuria developed and the blood urea-nitrogen increased from 18 to 28 mg. per 100 c.c.; the following day it was 31 mg. and the creatinine increased (1.98 mg.). No blood was found in the urine. In addition, the bilirubin content of the blood increased from 0.2 to 1.0 units. The urine urobilinogen remained normal. The patient insisted upon leaving the hospital and the drug was discontinued.

TABLE I

SHOWING EFFECTS OF DINITROPHENOL UPON RELATIVE CIRCULATION RATE AND RELATIVE OUTPUT OF HEART PER BEAT

	Pulse Rate			*Oxygen Consumption*		*Venous Blood*		*Arterial Blood*	*Volume oxygen (c.c.)*	*Circulation Rate*	
Exp.	*Basal*	*During puncture*	*B.M.R.*	*Litres per hour*	*c.c. per minute*	*Oxygen content* (*a*)	*Oxygen capacity* (*b*)	*Oxygen content* (*0.95b*) (*c*)	*used per 100 c.c. blood*	*Litres per minute*	*Output per beat*
1	(*a*) 62	70	+7	13.05	217	13.23	17.42	16.55	3.32	6.551	93.5
	(*b*) 60	74	+45	17.41	290	10.91	18.81	17.87	6.96	4.168	56.3
2	(*a*) 62	74	+7	13.05	217	10.91	17.42	16.55	5.64	6.551	88
	(*b*) 68	90	+52	18.23	304	10.91	14.77	14.03	3.12	9.743	108

(*a*) = control period.
(*b*) = effects of dinitrophenol.

Three weeks later there was no albuminuria, and the blood urea and creatinine returned to the normal level, 17 and 1.5 mg., respectively.

In the interpretation of the increase of blood urea consideration should be given to the possibility of increased tissue destruction with increase of metabolism. On this basis, however, one can hardly explain the increase of blood creatinine and the albuminuria. Kidney damage appears to be the probable explanation. In their 113 cases, Tainter, Stockton and Cutting[11] have, however, never observed the development of albuminuria. It should here be pointed out that this disturbance of kidney function was noted following the administration of 6 mg. per kilogram. This was more than has been generally used. It should, however, be noted that this amount was used for three days only, and, as previously stated, 3 to 5 milligrams were reported as harmless; and, other than causing

sweating, single doses of 5 to 10 milligrams were found to be harmless.[10]

The increase of bilirubin in the blood was very slight; and it may have been accidental and not causal. It may here be observed that Cutting, Mehrtens and Tainter[10] found no significant changes in the livers of animals exposed to the drug for months, according to studies of urine, the van den Bergh test, and autopsy findings. Theoretically, however, there is reason to suspect that dinitrophenol might be a liver poison . The close chemical resemblance to picric acid (trinitrophenol) and TNT (trinitrotoluol) is very suggestive.

From what is known of the drugs, they should find a wide application in physiology. Of special interest is the absence of any relationship between pulse and metabolic rate. The effects of dinitrophenol on cholesterol metabolism and metamorphosis of tadpoles[11] and its failure to alleviate the symptoms of myxœdema are of clinical interest also. Since they differ in this respect from thyroid gland, thyroxine and diiodothyronine, it would appear that there are at least two disturbances in this disease — one which lowers metabolism and the other which produces symptoms other than those due to such lowering. Dodds and Robertson have made the same suggestion with regard to dinitro-o-cresol. The data thus clearly indicate that there is as yet much to be known about the metabolism of these drugs before they can be recommended for application in private practice. It is suggested that small amounts used for months in many cases with no obvious deleterious effects afford no positive proof that these drugs cannot prove harmful if given over longer periods of time. Experiences with cincophen may be recalled here. Toxicity due to overdosage is, of course, no contraindication for the use of this drug any more than for morphine, arsenic, strychnine, or other dangerous but, if properly employed, very useful drugs; but the ease with which dinitrophenol increases metabolism, its known toxicity with excess dosage, and the difficulties with dosage (irregular response to the same dose in the same individual) emphasize the necessity of further study. In the opinion of the writers, the use of this drug in clinical work should as yet be confined to hospital practice.

The writers gratefully acknowledge the assistance of Miss Phyllis Holroyde who was responsible for all of the basal metabolic rate determinations.

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THE METABOLIC ACTIONS OF DINITROPHENOL WITH USE OF BALANCED AND UNBALANCED DIETS.—W. C. Cutting and M. L. Tainter have studied the effects of alpha-dinitrophenol (1-2-4) on basal metabolism, nitrogen balance, urinary organic acids and body weight in subjects on balanced diets and on diets unbalanced by including maximal amounts of carbohydrate, fat or protein. The dinitrophenol was administered by mouth for periods of from seven to sixteen days. The caloric values of the diets were adequate for the normal metabolism of the subjects. With the use of these diets, the basal metabolism was increased by from 30 to 50 per cent during medication with dinitrophenol. The subjects excreted less nitrogen than they ingested, yet there were definite losses of body weight. Therefore, body proteins probably were not broken down. The output of urinary organic acid was not increased, thus indicating that the fats were completely burned without giving rise to acidosis. Accordingly, dinitrophenol may increase metabolism in man, regardless of the energy materials of the diet, although it primarily promotes burning of carbohydrates or fat, at least during short periods, such as those used in this study and on diets of adequate caloric value. Clinically, dinitrophenol is indicated in treatment for obesity and may be therapeutically useful in other disease states with depressed metabolism. Its main advantages over thyroxine or powdered thyroid would seem to be a prompt and vigorous rise of metabolism and an absence of disturbing subjective symptoms. Its use appears to be relatively safe for as long periods as have been studied so far.—*J. Am. M. Ass.*, 1933, **101:** 2099.

REMARKS ON INTESTINAL PARASITES IN MONTREAL, AND THE RELATION OF *ENTAMŒBA HISTOLYTICA* TO COLITIS

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DURING the year 1933 I have been able to examine a number of stools of patients in the Royal Victoria Hospital, Montreal, with a view to ascertaining the general incidence of animal parasites among patients and to elucidating any cause of the intestinal troubles collectively grouped under the name "colitis." The need for this investigation was suggested to me, soon after my arrival in Montreal in January, 1933, by Prof. E. G. D. Murray, who, with Dr. F. Smith in the course of their own work, had already diagnosed *Entamœba histolytica* and *Endolimax nana* in some cases of colitis, and had reported that such cases were really amœbiasis. Prof. Murray considered that many more cases of colitis would prove, on investigation, to be cases of amœbiasis, the causal agent of which is *Entamœba histolytica*. He discussed the matter with Prof. J. C. Meakins and the latter kindly placed a room in his laboratories at my disposal and arranged facilities for the collection of specimens for examination.

MATERIAL AND METHODS

The stools examined were those of 139 patients in the Royal Victoria Hospital, male, female and infant patients being represented. Stools of patients suffering from intestinal malaise were sent to me, and many that served as controls were from patients suffering from other than gastro-intestinal complaints, such as dermatitis, nervous conditions, and lung affections. As far as possible, stools passed soon after admission were examined, as it was desirable to avoid possible elimination of parasites due to hospital diet. The stools, then, were partly those of a selected population and partly random samples.

Direct microscopical examinations of fresh preparations in normal saline, methyl green and Gram's iodine were used as routine methods. A concentration or enrichment method, using a modified Willis-Barber salt flotation technique, was carried out also in each case.

The number of stools examined for any one patient suffering from intestinal malaise of any sort was not less than two. The maximum number examined for any one patient was twelve. Of the random samples of stools from non-intestinal sufferers, often only one stool was examined. During the course of the work, a few stools were examined of private cases of medical practitioners. These will be mentioned later.

Prof. Murray and Dr. Starkey, of the Bacteriological Department, also conducted very detailed bacteriological examinations of the stools of some of the patients, particularly those in which *Entamœba histolytica* had been detected.

PARASITOLOGICAL FINDINGS

The parasitological results of examination of stools at the Royal Victoria Hospital may be summarized, the term "parasite" being used in a broad general sense. Thirteen species of animal parasites were detected, and one other organism, *Blastocystis*, probably of a fungoid nature, was also found. The animal parasites include 5 species of Rhizopoda, 3 of Flagellata, 3 of Cestoda and 2 of Nematoda.

The organisms found and the number of patients in whom they were detected are as follows:—

Rhizopoda.—*Entamœba histolytica*, 18; *E. coli*, 7; *Endolimax nana*, 6: *Iodamœba butschlii*, 3; *Dientamœba fragilis*, 4.

Flagellata.—*Tricnomonas hominis*, 3; *Giardia intestinalis*, 7; *Chilomastix mesnili*, 19.

Cestoda. — *Tœnia saginata*, 1; *Diphyllobothrium latum*, 2; *Hymenolepis nana*, 1.

Nematoda.—*Trichuris trichiura*, 2; *Ascaris lumbricoides*, 1.

Double infections occurred with nine combinations of parasites as follows:—

Entamœba histolytica and *Chilomastix mesnili* 9
Entamœba histolytica and *Dientamœba fragilis* 2
Entamœba histolytica and *Iodamœba butschlii* 1
Entamœba histolytica and *Giardia intestinalis* 2
Entamœba coli and *Giardia intestinalis* 2
Endolimax nana and *Chilomastix mesnili* 1
Endolimax nana and *Hymenolepis nana* 1
Dientamœba fragilis and *Trichuris trichiura* 1
Chilomastix mesnili and *Trichomonas hominis* 1

Triple infections occurred in five combinations:—

Entamœba histolytica, E. coli, Iodamœba butschlii .. 1
Entamœba histolytica, Endolimax nana, Chilomastix mesnili 1
Entamœba histolytica, Chilomastix mesnili, Trichomonas hominis 1
Entamœba histolytica, Chilomastix mesnili, Blastocystis 1
Entamœba coli, Endolimax nana, Iodamœba butschlii . 1

One case of quadruple infection was found, the stool containing *Endolimax nana, Tœnia saginata, Diphyllobothrium latum* and *Ascaris lumbricoides.*

Amœbæ derived from vegetable food were found in several stools.

Prior to May 1, 1933, before I began systematic work at the Royal Victoria Hospital, through the courtesy of Prof. Murray I was able to examine a few stools in his laboratory and so confirm some of his diagnoses. Seven infections with *Entamœba histolytica* were thus observed. During the period May to December, 1933, I have examined a very small number of stools for private practitioners, and so know of three more cases of infection with *Entamœba histolytica.* I also know of one case at the Montreal Women's General Hospital, having examined stools through the interest of Dr. Gavin Miller. These private cases included one infected with *Giardia intestinalis* and one with *Enterobius vermicularis.*

DISCUSSION OF THE RESULTS

As already mentioned, the stools examined represented in part a selected population and in part random samples. Consequently, they are not representative of a population as a whole. Nevertheless, there is much more than an academic interest attaching to these results.

A current opinion that human parasitic infestation does not occur in Montreal is evidently quite unjustified. The total number of species of animal organisms from the human intestine so far detected by me is 14 (including Blastocystis). As many as 4 kinds of Entozoa have been found in the fæces of a patient.

The incidence of *Entamœba histolytica* is relatively high. Twenty-nine cases of ambœbiasis have come under my personal notice, of which 18 were examined personally in one hospital. Allowing for the selected character of some of the cases, the number is still relatively high. In 2 of the cases at the Royal Victoria Hospital the patients had no suspicion of intestinal trouble being present, though both had suffered occasionally from diarrhœa, ascribed by them to dietetic errors. These patients undoubtedly had passed into the condition of carriers, and thus were all the more dangerous from the standpoint of public health. Both are now free from cysts as the result of energetic treatment, but the detection of two carriers gives rise to wonderment as to how many more carriers may be present, especially in rural districts where soil and water pollution are more likely than under city conditions.

A common source of human infection with *Entamœba histolytica* is the ingestion of raw vegetable foods, such as insufficiently washed lettuce and of unwashed fruits. In Montreal such infected vegetables and fruits may be unwittingly imported from areas endemic for amœbiasis, such as the southern parts of the United States of America and neighbouring islands.

Amœbiasis is not really a tropical disease; it may flourish better in the tropics, owing to environmental conditions, than in temperate regions, but it is not limited to the tropics. Due to the dispersal of men, particularly from the Balkans, Egypt, Mesopotamia and East Africa during and especially after the Great War, carriers of cysts of *Entamœba histolytica* passed into civil life and, due to non-recognition of the danger in some parts of the world, and to inadequate sanitary provisions, outbreaks of amœbiasis occurred in certain civilian populations in many parts of the world. Parasitological surveys of various civilian populations have also shown that the incidence of carriers is greater than was at first realized. In a port like Montreal, where, as in any port, there is a fluctuating seafaring population, derived from many races and travelling between the tropics and the port, it is inevitable that some cases of amœbiasis should occur.

Enquiry as to the places of residence, holiday resorts frequented, previous illnesses, etc., showed that in quite half our cases there was a history of some duration of intestinal distur-

bance. Some of the patients had had symptoms when they had lived in other countries such as Russia, Poland and Central Europe. Some had been in Canada for several years; others had been born here. As far as I could ascertain there was no direct connection with the cases that were contracted at the recent Chicago Exhibition.

The Public Health authorities of the City of Montreal have been notified by Professor Meakins of each case of amœbiasis, so that they are aware of the situation.

The occurrence of *Entamœba histolytica, E. coli, Endolimax nana, Iodamœba butschlii* and *Dientamœba fragilis,* as well as amœbæ derived from food, indicates the need for great care in differential diagnosis of the Rhizopoda found in human stools.

Bacteriological examinations of stools of patients in whom *Entamœba histolytica* has been detected have been made by Prof. Murray and Dr. Starkey. These examinations have not revealed bacterial infections of a pathogenic nature. The patients who have been treated, mostly with emetine, have been freed from the infestation, and have regained health, with the exception of one patient who died shortly after diagnosis was established. The clinical aspects are being dealt with by Dr. Hardisty.

With regard to the flagellate infections, *Chilomastix mesnili* and *Giardia intestinalis* exercise pathogenic action and need treatment.

Three species of Cestoda have been detected. The presence of embryophores of *Tænia saginata* points to the ingestion of "measly" beef; embryophores of *Hymenolepis nana,* to contamination of food by rats and rat fleas; ova of *Diphyllobothrium latum* to ingestion of improperly cooked fish containing the plerocercoids of the tapeworm. All have a direct importance in public health.

The nematode ova detected — Ascaris, Trichuris and Enterobius—are encountered in all parts of the world and indicate the need for food protection and proper methods of disposal of nightsoil.

To summarize. Amœbic and flagellate infections and nematode infestations point to the need for proper sewage disposal, the keeping down of flies that can carry cysts or ova, and adequate prevention of contamination of water and vegetable foods by human excrement. Cestode infections indicate the need for careful scrutiny of meat and fish for such parasites, and for great attention to thorough cooking.

Acknowledgments:— I wish to tender my heartiest thanks to Professors E. D. G. Murray and J. C. Meakins for their continued interest and practical sympathy in this investigation.

ENTAMŒBA HISTOLYTICA AND COLITIS IN MONTREAL

By R. H. M. Hardisty, M.D.,
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THE following clinical notes supplement the laboratory details supplied by Dr. Porter (this *Journal,* p. 134).

For some years past there have been occasional cases of so-called "ulcerative colitis" in the medical wards of the Royal Victoria Hospital, and since July, 1931, until recently, no diagnosis more definite than this has been made in this type of case. In the past year, however, closer investigation has been carried out, dating from the admission of a patient who gave the information that while in a naval hospital in New England *Entamœba histolytica* had been found in his stools. This had not been confirmed by other examinations there, nor could we detect any of the organisms, but at about this time the admission of other cases of severe colitis and ordinary diarrhœa led to an intensive examination of the stools, with the results described by Dr. Porter.

Since March, 1933, *Entamœba histolytica* has been observed in the stools of 21 patients admitted to the Royal Victoria Hospital. This is not a great number, but is many more than is usually seen in this hospital.

Several of the patients were admitted with very acute dysenteric symptoms, but in most of them these symptoms were only subacute, or entirely absent.

The four or five very acute cases were residents of this city or the suburbs, and none had recently been away from home, and none had had previous similar attacks. One fatal case, a woman of 52, resident of this city, taken

ill three weeks before entering hospital, stated she had not been away from home for three months before becoming ill. This was a very acute case and she died four days after admission. Another acute case, a labouring man, employed by the city, and working on the city water supply intake, had violent cramps and bloody stools for three days before admission, when he showed numerous Entamœbæ in his stools. There were several other cases of this type, in all of which recovery took place.

In a large number of cases the symptoms were more subacute or chronic and had lasted for several months or more. In one instance a similar attack had occurred six years previously in Toronto. This patient showed very intractable symptoms and eventually died. Three other cases had quite recently been in this same hospital and had been diagnosed and treated for ulcerative colitis, but the specific cause had not been recognized. *Entamœba histolytica* was found in two cases where it could not be considered the important factor in the causation of symptoms, at the time of admission at least. One was a case of advanced carcinoma of the sigmoid in a man from a small village in Prince Edward Island who had had chronic dysenteric symptoms for three years. The other was a case of tuberculous enteritis in a man who had been ill for one year.

Four patients, all of whom had lived most of their lives in this city, had no dysenteric symptoms at all, either on admission, or during their stay in hospital. They were admitted for various other reasons, and *Entamœba histolytica* was discovered in their stools on routine examination only. These patients were true carriers, and probably constitute the greatest danger to the community, as they are most likely to go unrecognized.

Most of the patients developed their symptoms in the city. Of the others one had lived several years in China; two had had attacks of dysentery in the East during the war; one came from the Eastern Townships; one was taken ill at a summer resort in the Laurentians, and one had stayed in August, 1933, at the hotel in Chicago where so many cases are said to have been contracted last May. One other case, as previously mentioned, probably contracted the disease in Toronto six years ago, and one case came from Prince Edward Island,

TREATMENT

Most of the patients were treated for the disease while in hospital, and as a rule improved, but two died. Emetine hydrochloride was the drug chiefly used, and when given in small doses of one-half to one gram hypodermically, once or twice daily for 10 to 12 days, the Entamœbæ disappear from the stools, but are apt to reappear again later. There is at present (January 1st), a patient in hospital with symptoms and positive findings in stools who was discharged well and with negative stool findings four months ago.

Carbarsone has also been used quite recently, but apparently does not cause such prompt disappearance of the Entamœba. Yatren enemata have also been used in one or two cases.

In our very limited experience emetine given hypodermically seems to be a very satisfactory drug, but it should be used with caution, as it frequently causes toxic vomiting and diarrhœa, and may cause marked circulatory depression.

From a consideration of these cases it is evident that most of them would have passed unrecognized but for the fact that Dr. Annie Porter, a trained worker in this field, happened to be making a survey of the stools of patients admitted to the hospital. It is also evident that amœbic infection is quite a common thing not only in our own city but probably also in all eastern Canada. Another fact that comes up is that more than half the number of these cases were admitted within the last two months, and five are at present in the hospital (January), so that it is very likely that more cases will be encountered, and we must therefore be more on our guard to recognize them and to prevent the spread of the disease than we have been in the past.

THE PRACTICAL APPLICATION AND INTERPRETATION OF THE SCHICK TEST: THE DIPHTHERIA ANTITOXIN CONTENT OF THE BLOOD OF THE SHICK-NEGATIVE REACTOR*

BY DAVID L. KLEIN, M.D., D.P.H.,

Montreal

THE purpose of this work is twofold; to explain certain difficulties that may be encountered in the interpretation of the Shick test, and to emphasize the practical value of this ingenious and economical procedure.

At the very outset I would like to make clear the information obtained from a judicious application of the test. Through it we are able to divide individuals into two groups—those who are susceptible and those who are immune to diphtheria. However, it is essential to bear in mind that a positive reaction to the Schick test signifies only presumptive evidence of susceptibility, while a negative result indicates immunity. The duration of this immunity is difficult to establish, but it should last in the majority of children for more than six years, if not for life.

The value of the test has been fully demonstrated by many researches. O'Brien, Okell, and Parish,[1] observed a group of more than 20,000 Schick-negatives over a period of 6 years. Only 18 of them developed diphtheria. With the exception of one, all the cases were mild. Guthrie, Marshall, and Moss,[2] infected two small groups of volunteers with virulent diphtheria bacilli. The Schick-positives contracted the disease in question, but the negatives escaped it. Ker and McGarrity[3] tested 55 patients in the acute stage of diphtheria. Fifty-four were Schick-positive, as they ought to have been; one who was negative was later considered as a doubtful case of diphtheria. Two thousand two hundred Schick-negative scarlet fever patients were placed in the Willard Parker Hospital in beds next to the diphtheria patients. None of them contracted undoubted diphtheria in spite of the fact that they did not receive a prophylactic dose of diphtheria antitoxic serum and that 20 to 25 per cent of them harboured virulent diphtheria bacilli.[4] Park[5] states emphatically that he has never seen undoubted diphtheria in a Schick-negative child in whom the test had been done recently by an expert.

I shall now turn to a phase of the test which need not annoy the clinician, although it has aroused a great deal of scientific interest, since through it some observers have endeavoured to cast doubt on the value of the Schick test. In order that an individual be immune to diphtheria he should present a negative reaction to the test and have in his blood about or more than 1/30th of a unit of the specific antitoxin per c.c. Some investigators have reported less antitoxin in the blood of a certain percentage of their Schick-negatives[6, 7] and practically no antitoxin in some of them.[8, 9, 10, 11]

My own findings on the subject corresponded to those of Messeloff and Karsh.[12] I tested the blood of 66 Schick-negative children prior to the performance of the Schick test. Some of these children were naturally immune, but most of them had been immunized artificially with toxoid. Out of the 66 cases 65 had a blood titre of $>1/30$th of a unit per c.c. One had $<1/30$ $>1/75$th of a unit. I considered this to denote immunity and decided to demonstrate the immunizing power of the Schick test dose of toxin[13 to 17] and control. Therefore I repeated, in the last case, the blood examination nine days after the performance of the Schick test. This time I found the blood titre to be that of $>1/30$th of a unit per c.c. I did not find a Schick-negative child with no antitoxin in the blood. It is difficult for one who did not find this discrepancy between the negative reaction and the blood antitoxin to believe that it can possibly exist. However, if the Schick test be performed properly with a toxin of proven potency and if such a discrepancy actually can present itself, then one might offer either of two explanations. The first is less likely to suit the occasion and, if it be possible, it must be a rarity. Since there are congenital anomalies

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* Read before the meeting of the Pædiatric Section of the Montreal Medico-Chirurgical Society, on October 13, 1933.

From the Children's Memorial Hospital, Montreal.

in the anatomical structure of certain individuals, then it is reasonable to assume that there are people who have a congenital anomaly in their diphtheria immunity mechanism. As the result of this anomaly their tissues would not react to the Schick-test dose of toxin, thus giving rise to a negative reaction to the test in the absence of blood antitoxin. The fault, then, would not lie in the Schick test but rather in a peculiarity of nature. If an individual presenting such an anomaly be contaminated with the ordinary clinically infective dose of diphtheria bacilli the toxin thereby liberated would probably pass through his tissues without setting up an attack of diphtheria. On the other hand if the contamination were to take the form of an extraordinary overwhelming diphtheria intoxication then the individual in question most likely would develop the disease, in a manner analogous to that of some lower animals. For instance the rat who can survive an injection of 1000 minimal lethal guinea pig doses of diphtheria toxin succumbs nevertheless to 4000 such doses of this toxin.[22]

A more likely explanation is that suggested by Kellogg and Stevens.[11] They found no antitoxin in the blood of some individuals who became Schick-negative after injections of toxin-antitoxin. They hold that these cases are latently immune for two reasons. Some people develop antitoxin after artificial immunization with toxin-antitoxin but lose it from the bloodstream, and people with latent immunity develop appreciable amounts of antitoxin after a single repeated dose of the same antigen and even after the administration of the Schick-test dose of toxin.

In spite of the above-mentioned theoretical considerations the practitioner may be assured that for all intents and purposes the Schick test is a reliable means of distinction between immunity and susceptibility to diphtheria "when properly performed with a toxin that had been accurately standardized."

The very simplicity of the Schick test lends itself readily to application in private practice; but in order that he may derive the full information from it the physician should bear in mind certain basic facts.

A complete Schick test consists of two parts, (1) the use of a dilution of toxin, and (2) a dilution of toxoid as control, which for the purpose is just as good as heated toxin.[24] Exactly 0.1 c.c., of each is injected intradermally, one for each arm, the left customarily for the control. During the process there appears a wheal in which the pores of the skin stand out prominently. The first reading made in 24 or 48 hours determines the presence of a false reaction at the control site. A final one at the end of 7 days will in the majority of instances determine the result as negative or positive.

The principle of the test is quite obvious. An individual who is susceptible to diphtheria has in his tissues no protective substances against the specific toxin. Therefore when injected the toxin works unhampered in the unprotected tissues. The result is a true reaction, known as the positive Schick reaction. As the person is subjected to repeated subinfective doses of the diphtheria bacilli, or after repeated injections of the toxoid, his tissues form the protective substances or antibodies. A modification of the true reaction now occurs in direct proportion to the amount of antitoxins formed. Eventually enough antitoxin is produced by the tissues to completely neutralize the test dose of toxin and the condition is at this point that of Schick-negative with no true reaction.

However the matter does not end here. Certain people, if not all, during the process of immunization, develop a sensitivity to the protein of the diphtheria toxin, and will on this account give a reaction,[18, 19, 20] known as the pseudo or false reaction. This reaction, due entirely to a sensitization to the protein of the toxin, may occur in the partially immune as well as in the completely immune subject. For this reason there was introduced as an adjunct to the Schick toxin test a control of inactivated toxin or toxoid, so that a true reaction could be distinguished, thereby, from a pseudo or false one. A reaction to the control means therefore some degree of sensitization to the diphtheria bacillus protein, and not to the death-dealing factor in the toxin.

It is interesting to note that individuals may become desensitized to the protein in question. A person may show a strong reaction to the control at one time, but may have little or no reaction to it if retested at a later date.[18] This phenomenon is often noticed in the giving of the toxoid injections for immunization purposes, when there may be a reaction to one or both of the preliminary inoculations, but little or none after the last one.[21, 23]

The control may also present quite a paradox. There may be a reaction to the control in the absence of one to the toxin test. Table I shows this in a group of 7 immune children. Moloney and Fraser report the same condition of affairs.[24] It has no significance.

TABLE I

Case	Age in Years	Schick Toxin Reaction	Control Reaction		*Blood
			Size (cm.)	Duration (Days)	
R.L.	11	0	1	4	>1/30
R.T.	10	0	3	2	>1/30
G.L.	12	0	3	2	>1/30
T.T.	11	0	3	1	>1/30
M.S.	12	0	1	3	>1/30
M.W.	8	0	1	3	>1/30
J.B.	10	0	0.8	4	>1/30

*Blood—Units of Antitoxin per c.c.

The control is invaluable in its ability to forecast the degree of reaction that might be expected from the toxoid injections in an individual who is Schick-positive. The false reaction appears in 24 hours and usually disappears in 72 hours. If in 24 or 48 hours there is a reaction to the control, less than one-half inch in size without induration, the full three immunization injections may be given without fear of severe reaction to them. If the reaction to the control is greater, especially in the presence of induration, strong reactions will likely appear after the ordinary toxoid dose. It would then be wise procedure to give the specially diluted toxoid as prepared by the Connaught Laboratories for toxoid reactors, in order that severe reactions may be avoided. However, I know of no death ever having occurred as the result of the most violent reactions to the ordinary toxoid injection.

A careful study of the complete Schick test will reveal the reasons for the choice of making the final reading on the 7th day, and the importance of the control test. Ordinarily the true reaction to the toxin appears in 24 hours but it may be delayed[3] until the fourth and even the fifth day. As a rule, the control reaction disappears in 3 days, but it may last longer. In two of my cases both toxin and control reactions lasted for 9 days. The Schick test was non-interpretable. Blood titration, however, showed that these two were immune. If the control had not been done, a final reading even on the 7th day would have lead the observer to consider the two as Schick-positive. Park[5] holds that the non-interpretable reaction occurs in 2 per cent of cases among older children and adults. In a group of 9 children (see Table II), all immune, as shown by the Schick test and by blood titration the control lasted as long as the toxin reaction. If a control had not been done, and if a final reading had been made on the 4th day, 8 immunes would have been classed as Schick-positive. A final reading on the 5th day would have lead to an error in one case. Thus we see the importance of the control test and of the choice of the 7th day for the reading of the result of the Schick test.

TABLE II

Case	Age in Years	Schick Toxin Reaction		Control Reaction		*S.	†Blood
		Size (cm.)	Duration (Days)	Size (cm.)	Duration (Days)		
G.G.	6	2.0	4	2.5	4	0	>1/30
P.L.	10	0.7	4	0.7	4	0	>1/30
R.G.	12	1.0	4	1.0	4	0	>1/30
H.M.	12	1.5	4	1.9	4	0	>1/30
F.P.	13	1.5	4	1.0	4	0	>1/30
F.S.	13	1.8	4	3.5	4	0	>1/30
R.B.	12	1.5	4	2.5	4	0	>1/30
H.M.	15	0.8	5	0.8	5	0	>1/30
T.	12	0.8	3	1.0	3	0	>1/30

*S.—Schick.
†B.—Units of Antitoxin per c.c.

A negative Schick reaction may occur in one of two forms:— (1) No reaction at the site of the toxin injection and none at the control site. This is the commoner type. (2) No reaction at the toxin site, with an area of redness at the control site. A positive reaction consists of an area of redness or pigmentation at the site of the toxin injection, with little or no reaction at the control site. The non-interpretable reaction consists of an area of redness or pigmentation at both sites about equal in size and intensity. This type of reaction in all probability signifies immunity, with a high degree of sensitivity to the diphtheria bacillus protein. The Connaught Laboratories advise that this immunity be established by blood-titration.

When shall the Schick test be performed?[5] (1) Prior to immunization. It is not essential for children under 5 years of age, since they are generally susceptible after the age of 6 months. At the fifth year the Schick test may be performed without the control. For children over 6 years of age and adults the Schick and control tests should be used. (2) After immunization with toxoid both toxin and control tests should be done at any age.

I wish to thank Dr. H. B. Cushing and Dr. Alton Goldbloom for their advice and helpful criticisms; and Dr. W. G. Turner for granting me the use of the wards of the Shriners' Hospital, where some of the cases, studied in the foregoing work, were hospitalized.

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A CLINICAL REVIEW OF TWO HUNDRED AND FORTY-ONE CASES OF OBSTRUCTION OF THE SMALL BOWEL*

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THE failure to reduce the mortality in intestinal obstruction in recent years is striking. For fifty years reports issued at various times have put the death rate at from 40 to 50 per cent. Essentially the same rate is shown in a recent review by Vick[1] covering 3,625 cases, exclusive of external hernia, in which the mortality averaged 38.8 per cent. This high mortality has been an incentive to increased investigation, and a great deal has been learnt. The rôle played by dehydration is fully appreciated and its relief by saline therapy is widely applied. The value of the x-ray film in confirming the diagnosis is more and more accepted. The mortality, however, remains about the same. Why?

The answer, apparently, has not been found by experimental work, but will probably be rather in teaching the general practitioner the necessity of early diagnosis and early surgical intervention. Delay is the greatest cause of high mortality. This fact cannot be overemphasized or given too much publicity. Unrelieved obstruction causes death in practically all cases. Ninety per cent could be saved if they reached the operating table in six hours. The responsibility for unnecessary deaths rests on the family, the general practitioner, and the surgeon. In thirty years the mortality in appendicitis fell to one-fifteenth of what it had been, thanks to increased knowledge and education.[2] Education can perform similar results in the case of intestinal obstruction.

It has been stated that each hour's delay increases the mortality by 1 per cent, which is, of course, only approximately correct. How close to the truth it comes, however, can be seen when the mortality rate of external strangulated herniæ, which are diagnosed and treated early, is compared with that due to internal causes, which frequently offer considerable difficulty in diagnosis. In the present series, the former shows a mortality of 14.7 per cent, while in the latter it rises to 51.7. In Tables to be given later these differences will be shown in detail. In obstruction due to internal causes the family at first does not appreciate the seriousness of the condition and the dangers of delay. Home remedies are applied, usually castor oil, or a laxative. Finally the family doctor is called, usually late at night. If the diagnosis is not obvious, morphine is frequently administered, in the hope that the patient will be well the

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next day. With no improvement at that time the surgeon is finally called, and even he may delay in operating.

Two types of drugs are contraindicated in intestinal obstruction, or in any acute abdominal condition. The first is the purgative. In acute appendicitis, the violent peristalsis produced tends to spread the infection; in obstruction it would appear to increase the distension above the obstruction, increase the loss of fluids into the bowel, and lead to earlier fatigue of the bowel. The family doctor should endeavour to restrain the widespread use of cathartics for every abdominal pain which is practised in so many of the poorer homes. The other dangerous drug is morphine, too frequently administered by the family doctor before an acute abdominal condition is accurately diagnosed. It brings easy relief of pain, but masks the signs and symptoms and makes diagnosis almost impossible. Every medical student should be made to appreciate fully the danger of morphine's masking the symptoms in acute abdominal conditions.

The two most characteristic symptoms of intestinal obstruction are rhythmical crampy pain, and vomiting. When these are present a tentative diagnosis of intestinal obstruction should be made and the patient immediately sent to hospital. If this rule were generally observed the mortality for intestinal obstruction would probably fall to 10 or 12 per cent. Distension in small bowel obstruction is a late symptom. Marked distension is more characteristic of large bowel obstruction. Fæcal vomiting is a late sign, which implies a high mortality. Diagnosis should be made and surgical intervention instituted before it makes its appearance. Visible peristalsis is an important sign, if seen, but is more frequently absent than present. It is usually seen only in comparatively thin persons.

Many patients have a bowel movement after the onset of obstruction, for the bowel below the site of obstruction contains fæces and flatus. The first enema is therefore frequently effectual. The present review of cases suggests that the consideration which most frequently delays operation is the observation that the early enemata are more or less effectual. Perhaps a little flatus, or a small piece of stool is returned with the enema, which is usually coloured. The nurse or orderly reports that the enema is effectual and further doubt is thus thrown on the diagnosis, with consequent further delay in operating. These first enemata are so important that their results should be observed by the physician himself.

Intestinal obstructions are either complete or incomplete. When incomplete the symptoms progress slowly, often intermittently, until complete obstruction occurs. As long as the lumen of the bowel is open the danger of death is slight unless the obstructing mechanism causes perforation. When the obstruction is incomplete the intestinal fluids can get past the obstruction, so that dehydration is rarely an important factor.

In a typical case, how is the sequence of vomiting, colicky pain, visible peristalsis, borborygmi, abdominal distension, dehydration, and toxæmia produced? The irritation of the obstruction causes reflex vomiting, with emptying of the stomach and increased peristalsis, as the bowel endeavours to overcome the obstruction. The peristalsis, though almost continuous, causes the rhythmical crampy pain so typical in these cases. This hyperperistalsis is so great that it can be seen in thin-walled persons. At this time bubbling and gurgling, produced by the increased activity, can be heard on auscultation. As nothing can get beyond the obstruction, once the lower bowel is empty, no further bowel movements take place and enemata are ineffectual. In abdominal colic due to other causes enemata are usually effectual and, by lessening distention, tend to give relief. This is very characteristically shown in the relief of post-operative gas pains by enemata. In obstruction they give no relief. Above the obstruction the intestinal secretions collect. Bacterial growth and fermentation produce gas, and so distension occurs. This is very characteristically shown in x-rays quite early after the onset.

The vomiting at first consists of stomach contents, then the green contents of the duodenum, and, later, the yellowish, finally brown, foul-smelling material from the jejunum and ileum. The secretions poured into the stomach and upper bowel amount to as much as ten litres daily. This is lost by vomiting and by retention in the ileum. Fluids taken by the mouth are similarly lost, and so dehydration occurs early. The loss of free hydrochloric acid by vomiting produces alkalosis. In man there appears little doubt that, with the large distension which follows low small-bowel obstruction, absorption of toxins occurs, and so a toxic factor is also pres-

ent. Recent experimental work on dogs shows that distension of the bowel causes early death before dehydration is a marked factor. Further, as most clinical cases of obstruction are of the strangulated variety, there is a tendency to early change in the bowel wall, with approaching gangrene and marked toxæmia. Thus, unless the condition is relieved early the patient progresses downhill until death ensues.

In the present report only those cases of complete mechanical small bowel obstruction have been reviewed which were admitted to the Royal Victoria Hospital, Montreal, between April 1, 1921, and April 1, 1932. Cases of intestinal obstruction immediately following abdominal operations, for example, appendectomy, have not been included. Paralytic ileus also has been excluded, as we believe it should form the basis of a separate study. Large-bowel obstructions have also been omitted, as such cases differ in many important characteristics from those of small-bowel obstruction.

In this eleven-year period, 241 cases of complete mechanical small-bowel obstruction were admitted, 156 being cases of strangulated external hernia, and 85 being due to internal causes. The mortality among the cases of hernia was 14.7 per cent, while in those due to internal causes the mortality rose to 51.7; for all cases it was 27.82. That this great difference is largely due to difficulty in diagnosis and consequent delay in operative relief is clearly shown in Table I, where the mortality per cent is shown in relation to hours elapsing between the onset of symptoms and the institution of surgical relief. In Table 11 the years 1932 and 1933 have been omitted as they are incomplete years, except for total figures.

These tables show not only the increase in mortality as delay occurs between onset and relief but also that the lower mortality in strangulated hernia is largely due to early recognition and surgical intervention. This is, of course, not the only reason, for it is evident that the operation for obstruction due to an internal cause is frequently much more hazardous; for example, when an obstruction is due to matting together by adhesions of the small bowel deep in the pelvis, the remainder of the bowel being greatly distended, a surgical task of great magnitude presents itself. The mortality in these cases is necessarily high.

TABLE I.

COMPARISON OF MORTALITY PER CENT AND NUMBER OF HOURS ELAPSING BETWEEN ONSET OF SYMPTOMS AND SURGICAL RELIEF OF THE OBSTRUCTION.

Hours Delay	*Mortality Ext. Hernia*	*Other Causes*	*Total*
	Per cent	Per cent	Per cent
0 – 12	6.3	0	5.7
13 – 24	6.0	25	9.7
25 – 48	3.2	52.6	22.0
49 – 72	46.1	50	48.1
73 – +	45.0	68	57.7

TABLE II.

Year	*Mortality Ext. Hernia*	*Other Causes*	*Total*
	Per cent	Per cent	Per cent
1931	23.8	60	35.4
1930	30.0	40	33.3
1929	26.2	37.5	29.6
1928	0.0	62.5	27.7
1927	0.0	55.5	18.5
1926	0.0	37.5	14.2
1925	10.0	50.0	16.6
1924	27.2	33.3	30.4
1923	14.2	81.8	44.0
1922	18.1	57.1	33.3
Total including 1921 and 1932	14.7	51.7	27.8

Seventy-seven per cent of hernia cases were operated upon in the first forty-eight hours while only 45 per cent of cases due to internal causes were operated upon at this stage.

In a small series like the present there is little to be gained from a study of mortality in relation to the cause of internal obstruction. Table III is inserted, however, as it shows, in addition, the approximate frequency of the various etiological factors. There are 247 cases reported here because some cases which have been omitted in Table I, owing to the obstruction being incomplete, have been included, when the etiological factor is of unusual interest, *e.g.*, subperitoneal myoma of the duodenum.

While the majority of cases are operated upon within five hours of entering the hospital many are allowed to wait longer. Thus out of 227 patients operated upon, 160 were opened up before five hours had elapsed, while 67 were allowed to wait longer. Thirty-four such cases waited over 20 hours. This is due partly to the fact that some of the atypical cases are exceedingly difficult to diagnose, but also to the present tendency of surgeons not to open the abdomen until a definite diagnosis is assured. We cannot support this latter attitude. Only when

these cases are operated upon early can the present high mortality be adequately reduced. To-day great importance is laid on the x-ray in the Royal Victoria Hospital as a means of diagnosis. These pictures are at times very difficult to interpret. If the clinical condition strongly suggests obstruction the abdomen should be opened in spite of the x-ray. A simple laparotomy does little damage; delay kills. There is little doubt that with symptoms of the "acute abdomen" present, operation with a mistaken diagnosis is often less hazardous than delaying until an absolute diagnosis is established. Reference is made, of course, only to those cases which are in the hands of well-trained surgeons, whose judgment is based on a large experience.

TABLE III.

MORTALITY IN RELATION TO ETIOLOGICAL FACTOR

Etiology	*Died*	*Lived*	*Total*	*Mortality Percentage*
Hernia—external	23	133	156	14.7
Hernia—internal	2	1	3	66.6
Adhesions—post-operative and inflammatory	14	26	40	35.0
Adhesions—tuberculous	4	3	7	57.1
Intussusception	10	6	16	62.5
Volvulus	5	4	9	55.5
Meckel's diverticulum	3	3	6	50.0
Mesenteric thrombosis	1	1	2	50.0
Gall-stone impacted	2	0	2	100.0
Spasm of intestine	0	1	1	0
Kink of intestine (after release of hernia)	0	1	1	0
Congen. atresia of ileum	1	0	1	100.0
Carcinoma of ileum	1	0	1	100.0
Subperitoneal myoma of duodenum	0	1	1	0
Choked pelvis	1	0	1	100.0

Desiring to find the exact reasons for delay, a study was made of the 11 cases of strangulated hernia which were allowed to wait over twenty hours before relief. A brief abstract of each case is recorded below, as they illustrate in a remarkable way some of the factors leading to delay. In 3 cases a small, non-palpable femoral hernia was at first overlooked; two of the patients died. In two cases the enemata were reported effectual and operation was postponed; one patient died. In two cases the delay was considered justified because abscesses were present together with strangulated ventral hernia; one of these patients died. One case shows the danger of depending too much on the emergency x-ray, which at first was not conclusive, so the patient was held over for a barium series the following day. In two other cases the reason for the delay was not apparent from the history. The mortality in this group of patients was 54.5 per cent, which compares with a mortality of 10.1 per cent among the cases in which relief was instituted before 20 hours.

Eleven cases of strangulated hernia were left 20 hours or more before relief. Table IV shows the various factors leading to this delay.

TABLE IV.

Case 1. Operation was delayed on account of abscess and fæcal fistula. It was thought the fæcal fistula would relieve the obstruction, while it was not considered advisable to open the abdomen in the presence of abscess.

Case 2. Secondary obstruction following the relief of strangulated hernia thought to be due to paralytic ileus. Autopsy showed a portion of the ileum thickened and œdematous, producing obstruction.

Case 3. An inguinal hernia was operated upon, while a small femoral hernia, not palpable, which was strangulated, was overlooked.

Case 4. A small, non-palpable femoral hernia, which was strangulated, was found at operation.

Case 5. A small, non-palpable, femoral hernia of Richter's type was missed at first. Delay was due to waiting for a gastric series which showed distension and fluid levels.

Case 6. Obstruction was due to ventral hernia, but the reports of effectual and moderately effectual enemata caused delay.

Case 7. Strangulation and obstruction was not considered present when the second enema was reported effectual.

Case 8. Appears from the history to have been a typical case but was made to wait for a barium enema the following day.

Case 9. Ventral hernia with abscess of abdominal wall. Operation was not performed on account of abscess.

Case 10. A typical case with no known reason for delay.

Case 11. A flat x-ray plate was not conclusive, so delay occurred while a barium series was carried out.

The value of the x-ray in diagnosis.—Mention has been made of the value of x-rays in assisting in the diagnosis of small-bowel obstruction. In the present series 52 cases were x-rayed. Many of these films were anterior-posterior views taken with the patient lying on the back, so that fluid levels were not shown in these cases. These films are not so valuable as those taken with the patient lying on the side, or in the upright position. Distension of the bowel by gas and the presence of fluid levels, are the most important x-ray findings in cases of bowel obstruction.

Of the 52 cases which were x-rayed, the diagnosis was definitely helped in 36. Among the 16 cases in which x-ray did not assist in the diagnosis were quite a few poor plates taken under emergency conditions. Of the 36 helpful plates, 22 showed the presence of distended bowel, and 18 the presence of fluid levels. These figures show that though the x-ray picture is

helpful in arriving at a diagnosis it must be considered only as part of the general diagnostic measures, as in a considerable number of cases in this series it did not assist the diagnostician. Undoubtedly, with increased experience in interpreting the films this percentage of failures will fall.

In a recent article Ochsner[3] has stated that, as early as one hour after the onset of obstruction, there is sufficient gas accumulation to diagnose ileus roentgenologically. If the only condition that produced gas in the small bowel was obstruction Ochsner's conclusions might be accepted. Unfortunately, a little gas is frequently present in the small bowel where no obstruction is present. At the Royal Victoria Hospital it has been concluded that this is usually due to some inflammatory lesion in the abdomen, involving the peritoneum (cholecystitis, pancreatitis, salpingitis, etc.). To diagnose obstruction a considerable amount of gas, preferably with fluid levels, should be present, together with signs and symptoms suggesting obstruction. In infants and in old people gas is occasionally present in the small bowel in small amounts, and may be of no clinical significance. Ochsner's conclusions were based on experimental obstruction produced in dogs. Obstruction will always produce gas above the obstruction. Ochsner did not disprove, however, that other causes may produce gas in the small bowel, such as localized peritonitis.

White blood count.—While it is widely considered that a leucocytosis in an acute abdominal condition points to an inflammatory condition, the white blood count in this series, and in recent reports of similar series, do not support this assumption. Leucocytosis is frequently present in small-bowel obstruction. In 30 cases of simple obstruction in which a white cell count was carried out, the highest count was 28,600 and the lowest 5,500, the average being 11,388. In 28 cases of strangulated obstruction the highest count was 26,100 and the lowest 6,450, the average being 12,886. These counts were carried out much less frequently in cases of strangulated hernia, where the diagnosis was obvious, than in those cases, usually more serious, which presented more difficulty in diagnosis. This is probably a factor in the high average results obtained. Vidgoff[4] reports an average white cell count of 7,900 with a range from 5,400 to 28,000, while Cornell's[5] average was 15,445, with a range of 5,940 to 26,240. It is evident, therefore, that a marked leucocytosis is frequently present.

Temperature and pulse.—As intestinal obstruction is usually associated with some degree of shock, such cases might be expected to show a rapid pulse with a low temperature. In a large series Cornell[5] reported an average temperature of a 100° F., with a high point of 103° and a low of 97.6°. Miller[6] states that temperatures range from subnormal to 105°, with early cases usually showing a subnormal temperature. In the present series the pre-operative temperatures ranged from 95.5° to 101.8°, the majority having a subnormal, or normal temperature. The mortality is high in those cases which show fever.

TABLE V.

Temperature	*Number of Cases*	*Percentage*	*Mortality Percentage*
95.5 – 98.6	123	52.5	22.7
98.6 – 100	90	38.4	30.0
100 – 102	21	8.9	47.6

It is evident that some cases of intestinal obstruction will show a high leucocytosis with considerable fever. This fact should be remembered, for one frequently hears the assertion that a high leucocytosis with fever rules out intestinal obstruction. While such findings suggest an inflammatory condition, obstruction cannot be ruled out on this evidence alone.

The pulse rises rapidly in most cases of intestinal obstruction and is a useful guide to prognosis. In the present series, out of 234 cases in which these factors were studied 134 showed pulse rates from 52 to 100, while the remaining 100 showed rates above 100. These figures include cases of strangulated hernia in which the pulse rate is usually lower, as this type of case is seen much earlier as a rule. Table VI shows the relation of the pulse rate to the mortality per cent and also shows that a large proportion of cases have a rapid pulse on admission.

Blood chemistry. — Experimental evidence abounds to show that in simple obstruction marked dehydration occurs, with definite lowering of blood chlorides, increase in Co_2 combining power, and an increase in the non-protein nitrogen. It appears probable that the loss of fluids and sodium-chloride in the gastro-intestinal secre-

tions so depletes the total ionic content of the blood plasma that plasma and interstitial fluid can no longer be maintained at normal levels. If at this time water alone is given intravenously, life is not prolonged, but if isotonic, or hypertonic sodium chloride solution is given, it is. Apparently, the presence of the salt enables the tissue to hold the fluid and dehydration is prevented. One of us (G.G.M.) has considered that the increase in nitrogen is largely secondary to the dehydration. As dehydration increases the

TABLE VI.

Pulse	*Number of Cases*	*Percentage*	*Mortality Percentage*
52 – 70	23	9.7	13.0
70 – 84	47	20.0	21.2
84 – 100	64	27.0	18.7
100 – 120	52	22.1	34.6
120 – 176	48	20.5	47.9

blood becomes thickened, and tarry, urine secretion is markedly diminished, so that normal renal function is upset and nitrogenous waste products are allowed to accumulate. Thus, as soon as saline is given the non-protein nitrogen tends to return to normal levels. The loss of free hydrochloric acid in the stomach secretion leaves the sodium radicle in the plasma, free to combine with Co_2, thus increasing the Co_2 combining power of the blood and leading to an alkalosis. We have shown experimentally[7] that in dogs, which are obstructed, after having the stomach resected, such an alkalosis does not occur. Webster and Armour[8] were able to restore the Co_2 combining power to normal values following obstruction, when they introduced HCl into a jejunostomy below the obstruction.

Clinically, this knowledge of the chemical changes occurring in the blood has not materially assisted in lowering mortality, apparently because simple high obstruction seldom occurs clinically. The majority of cases occur in the lower part of the small bowel and usually are accompanied by strangulation. In lower obstruction the fluids are, perhaps, reabsorbed to a greater extent. The marked distension adds other factors, such as toxæmia, to the problem. Where strangulation is present, with the tendency to early gangrene and marked toxæmia, dehydration plays only a minor rôle. The cases which die following strangulated obstruction may show little change on blood analysis.

In one case (R.V.H. Surgery, 68,708) with a high simple jejunal obstruction following splenectomy the patient was kept alive for several days on intravenous therapy until the diagnosis became clear and operation was performed. Had this been a case of strangulated obstruction the patient would have undoubtedly died. This again emphasizes the importance of early diagnosis and surgical relief. Blood chemistry and intravenous saline therapy are of definite but not prime importance. Intravenous saline should be given as a routine, but should not be allowed to interfere with immediate operation.

In a review of the blood chemistry findings carried out in the present series it is found the work has been rarely as complete as can be done in experimental obstruction. A typical case (R.V.H. Surgery, 69,067: Table VIII) shows

TABLE VII.

A CASE OF STRANGULATED OBSTRUCTION SHOWING LITTLE CHANGE IN BLOOD CHEMISTRY FINDINGS.

Time	*NaCl gm/L*	*Co_2 Per cent*	*N.P.N. mgm/100 c.c.*	*Result*
Pre-operative	6.2		43.2	
Post-operative				
1st day	6.3			
2nd day	6.2			
3rd day	6.0	65.5	94	Died

TABLE VIII.

Time	*NaCl gms/litre*	*Co_2 Per cent*	*N.P.N. mgm/100 c.c.*	*Saline Therapy*	*Result*
Pre-operative	4.7	78.2	38.08	+	
Post-operative, 1st day..	4.9	85.8		+	
	5.4	66.4		+	
	5.0	70.8		+	
	5.3	71.3		+	
	5.5	71.3		+	
	5.5	66.0		+	
	5.9	104.0		+	Died

a lowering of the chlorides with an accompanying alkalosis. The patient died nine days after a second operation for secondary obstruction due to adhesions. Daily saline therapy was instituted, and the blood chlorides post-operatively were maintained at normal levels in spite of secondary obstruction.

Here some difficulty was found in relieving the alkalosis. Had a weak solution of hydrochloric acid been given intramuscularly or, preferably, through an ileostomy, this alkalosis would have probably been relieved.

In the present series the mortality rate is higher among those cases in which blood analysis and intravenous saline therapy were carried out. These cases, however, were generally the more severe ones, so that it is probable the mortality would have been even higher had saline therapy not been instituted. Vidgoff[4] states that in the series he studied the values found by blood analysis played no part in either prognosis or diagnosis. The average blood chlorides of the patients who died were approximately the same as in those who recovered, *viz.*, 390 mgm. per 100 c.c. of blood. In several patients who died the blood chlorides were as high as 550 mgm., though a high-grade obstruction with gangrene was present. This bears out our own experience and supports our belief that the loss of chlorides and dehydration plays a minor rôle as a causative factor of death where strangulation is present.

Operative treatment.—The most important treatment in intestinal obstruction is surgical. It should be instituted at the earliest possible moment, and should be the simplest procedure that will relieve the obstruction in the shortest time. The following Table (IX), showing the mortality which accompanies various types of operation, is apt to convey a wrong impression if accepted at its face value. The high mortality among those cases which were resected or had a simple enterostomy or an entero-anastomosis cannot be blamed altogether on the operation, but rather on the fact that this group includes the more serious cases. Thus resection is usually carried out only in the presence of gangrene. If no gangrene is present simple relief of obstruction is performed. Whatever is done, the mortality will be high if the condition has progressed until the bowel is gangrenous.

TABLE IX.

Procedure	*Mortality Percentage*	*Number of Operations*
Release of adhesions	26.4	34
Relief of obstruction (includes herniæ)	13.3	157
Resection of bowel	67.7	31
Entero-anastomosis	83.3	6
Primary enterostomy	78.5	28

Anastomosis is always a precarious procedure in these cases. A distended loop, partially devitalized, does not make good material on which to work; the mortality is, consequently, always high. If the colour of a blackened loop of bowel tends to return on the application of hot compresses and the surface is glistening drop it back into the abdomen. One could almost say—If in doubt, do not resect; resection carries such a high mortality that it should not be performed if it can be avoided. It is frequently surprising how well patients do who have blackened loops of bowel dropped back into the abdomen without resection, after relief of the strangulation.

It is difficult to say why primary enterostomy carries such a high mortality. Vidgoff gives a mortality following this procedure of 79.8 per cent. It is usually only performed in very serious cases, when the condition of the patient does not allow a thorough exploration. A gangrenous loop might still be left unrelieved, so that toxicity is not overcome by the enterostomy. If the patient's condition will stand it an effort should be made to find and remove the cause of the obstruction. Paterson[9] has stated, "no form of anastomosis or resection is permissible in cases of acute obstruction." This is perhaps an extreme stand, but is worth repeating if it will restrain the enthusiasm of some surgeons who unwittingly increase their mortality by doing too much.

CONCLUSIONS

A brief summary of some of the more important findings among 241 cases of small-bowel obstruction studied at the Royal Victoria Hospital has been outlined. It has been shown that the mortality has not decreased in recent years. That the mortality is too high is the result of tardy diagnosis and delay in surgical intervention. It is essential to educate the public so that the physician will be called in early in cases suffering from acute abdominal symptoms. With the slightest suspicion of intestinal obstruction the patient should be sent to the hospital. Early surgical intervention assures a low mortality. These conclusions are supported by mortality Tables.

While as a rule the temperature is not increased, at times considerable fever is present. Similarly a marked leucocytosis may be present. The pulse rate is almost invariably quickened.

A brief discussion of blood chemistry findings

is included. It is evident that early surgical relief is much more important than saline therapy in reducing mortality. The operation performed should be the simplest possible, aiming only to relieve obstruction. Anastomosis of any type is accompanied by a high mortality.

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THE CLINICAL ASPECTS OF THE HISTOLOGY AND PATHOLOGY OF THE PANCREAS*

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IN this paper on the histology and pathology of the pancreas the author does not intend to discuss the subject from an academic standpoint, but rather to give a basis for the theories, symptoms and signs of pancreatic disease.

The glandular portion of the pancreas develops from the intestinal *Anlagen* in close relation to the liver bud. These intestinal *Anlagen* grow out into the dorsal mesentery which later forms the interlobular and a part at least of the intralobular connective tissue of the adult organ. The primitive capillary bed of the dorsal mesentery sends off vascular sprouts into the developing avascular intestinal *Anlagen* of the pancreas carrying with them connective tissue. This close relationship in development between the liver and the pancreas suggests that some connection may exist between the diseases of these two organs.

The pancreas consists in reality of two distinct organs—the acinar tissue, which empties its secretion into the duodenum, and the islands of Langerhans which give rise to an internal secretion called insulin. The cells of the acini contain many zymogen granules. These cells discharge their secretion into the system of the ducts, which in turn empty into the ampulla of Vater or directly into the duodenum. The cells of the ducts are separated from those of the acini by flattened cells known as centro-acinar cells. Scattered throughout the gland, in greater numbers in the tail than elsewhere, are the islands of Langerhans. The development and purpose of these structures for many years have been a centre for controversy, and even yet no unanimous opinion is held. Lane[15] and Bensley[5] have been able to show through special staining technique that the islet cells may be divided into A and B types. In diabetes it is only the B cells which are damaged.

The pancreas is surrounded by an anastomotic circle of vessels which is formed above by the superior pancreatico-duodenal and the splenic arteries, which in turn arise as branches of the coeliac trunk, while the inferior pancreatico-duodenal and the inferior pancreatic arteries, branches of the superior mesenteric artery, form the lower part of this vascular circle. The branches from these four arteries form an arterial plexus in the connective tissue between the lobules which is called the interlobular arterial plexus. The intralobular arteries arise from this plexus and usually a single vessel enters each lobule where it ends in glomerulus-like structures among the cells of the islands of Langerhans. Within these islands the vessels are large, tortuous, and lined by a single endothelial layer supported by a few strands of connective tissue; some of these sinusoids terminate in blind pouches surrounded by the island cells. Efferent arteries of much smaller calibre than the afferent vessels arise from the peripheral sinusoids and pass out into the interacinar capillary plexus. It is obvious that the wide calibre of the vessels within the islands, the blind pouches as well as the small efferent vessels, would produce a slowing of the blood stream and in this way may assist in the absorption of insulin from the island cells (Wharton[23]).

The blood is then collected from the interacinar capillary plexus by small venules which

* Read at the annual meeting of the Ontario Medical Association, Hamilton, 1933.

usually unite to form a single intralobular vein before leaving the lobule to empty into the interlobular vein. Throughout the pancreas there is a close association of the courses of the arteries and veins, except along the larger ducts, where there is a net-work of veins without a corresponding arterial plexus.

Simple connective-tissue spaces form the smallest lymph channels around the acini which empty into definite perilobular lymphatic capillaries. These capillaries collect the lymph from the pancreas into four groups of glands called from their position—superior, inferior, right and left. Bartels[4] has shown a close relationship between the lymphatics of the pancreas and duodenum. Franke[12] has also shown a direct lymphatic connection between the gall-bladder, ducts, appendix and cæcum with those of the head of the pancreas. These lymphatic channels are extremely significant when considering the pathology of this gland.

The nerve supply is derived from the vagus and sympathetic nerves throughout the solar plexus. A few nerve fibres pass directly to the cells of the gland; the rest form intermediary plexuses around the arteries and then pass with them to form delicate net-work around the acini and especially numerous in the islets (Pensa[20]). The vagus sends off parasympathetic fibres whose stimulation induces an active secretion. The sympathetic nerves act upon the secretion to a lesser degree. De Takats[10] is at present studying the effects of sympathectomy in animals.

DIABETES MELLITUS

When patients die of diabetic coma one would naturally expect to find the same marked pathological changes in each case. On the contrary, the pancreas will probably appear normal to the naked eye and may even seem so on microscopic examination. A survey of the literature will reveal the great variety of lesions which are said to produce diabetes. Among the more important ones which have been described are the following.

1. Hyalinization of the islands of Langerhans is now considered the most typical pancreatic lesion in diabetes mellitus. The nature of the process and the mechanism of its selective localization in the islets are as yet somewhat of a puzzle. Warren's view[22] is that the hyalinization is due to the production of an intracellular substance of fibroblasts and possibly by endothelial cells. This process when it becomes sufficiently marked to destroy the epithelial cells or to separate them from the blood stream results in the production of diabetes mellitus. This condition is prone to occur in the later years of life and is slowly progressive; the pancreas is able for a time to prevent insulin deficiency through its ability to regenerate.

2. The next most common lesion found is fibrosis. In the study of routine sections taken at the postmortem, the author has found that there is a definite increase of perivascular fibrosis in the islands after 40 years of age. This fibrosis in its early stage is seen as a single layer of fibrous tissue between the islet cells and the sinusoids. In some cases it practically replaces the whole island and is usually associated with an increase of interacinar connective tissue. Whether this has any definite relation to diabetes or is merely a part of the ageing process is open to question.

3. Certain cases of diabetes mellitus in young individuals show lymphatic infiltration in and about the islands. Warren[22] associates this lesion with severe diabetes which progresses rapidly, and the patients die in spite of adequate insulin therapy.

4. Weichselbaum[24] and Allen[2] have described hydropic degeneration in diabetes. This is the most marked lesion in the experimental diabetes of Allen and Homans.[13] The most striking point of hydropic degeneration is that it appears to be not the result of injury but of excessive functional strain. Apparently this change is reversible in its earlier stages, but later it leads to atrophy and disappearance of the cells. This condition would probably correspond to the "atrophy" of the adrenal glands with the production of Addison's disease, which Duff and Bernstein[9] have recently suggested is due to functional overstrain. It is stated that hydropic degeneration is less frequently found in insulin-treated cases although Warren[22] does not agree with this.

5. The islands are said to be fewer in number in diabetic pancreases than in the normal, but islands counts are laborious and too inaccurate to be relied on. The islands may appear normal.

De Takats and Wilder,[11] working on the

knowledge that tying off the ducts increases the number of islands of Langerhans distal to this, have tied off the tail of the pancreas in a diabetic child. This child, who had been followed for some years previously, and whose diabetic condition was progressive, improved under this surgical procedure. While this method of treatment cannot be applied generally, it probably should be considered in the progressive type of diabetes mellitus in the young patient.

We have sufficient evidence to show that the islands of Langerhans are at fault in diabetes mellitus. Yet we often cannot demonstrate a specific lesion but may find various pathological processes, as just described. It is possible that we are not dealing with a pathological entity but a functional deficiency of the island cells which can be produced in various ways. The answer will probably come with further study of the metabolism of these islet cells.

INFLAMMATION OF THE PANCREAS

The etiology of chronic pancreatitis is a much disputed point. There are three routes by which infection may occur: (1) through the ducts; (2) through the lymphatics; and (3) by direct extension from a peptic ulcer. Archibald[3] attributes pancreatitis to a spasm of the sphincter of Oddi and the forcing of bile back into the pancreas. Mann and Giordano[18] tied off the common ducts in dogs with the object of forcing bile into the pancreas, but did not produce pancreatitis. Deaver and Pfeiffer[8] favour the lymphatic route for the infection. In 27 out of 52 of their cases they were able to demonstrate enlarged lymph nodes. Franke[12] has shown that lymph from the gall-bladder drains to the head of the pancreas. Deaver[7] reports biliary infection in 91 per cent of his cases of chronic pancreatitis. The lymphatics of the duodenum, appendix and ileocæcal angle drain directly to the lymph glands surrounding the head of the pancreas.

Patients with chronic pancreatitis complain of a constant severe upper abdominal pain, more marked in the right upper quadrant, radiating to the back, which may be associated with vomiting. If the inflammation is more active there may be a swelling of the head of the pancreas with obstruction of the pancreatic ducts producing jaundice. Tenderness may be present in the upper abdomen. Necropsy specimens show atrophy, apparently due to increased connective tissue.

Acute hæmorrhagic necrosis of the pancreas or acute pancreatitis may be conveniently subdivided into: (1) that due to inflammatory conditions in the biliary tract or in the contiguous structures; (2) that due to degenerative changes of the vessels; and (3) that due to trauma of the pancreas. These patients complain of pain in the epigastrium, which may radiate to the back or to the loins, associated with nausea, vomiting, jaundice, and clay-coloured stools. This epigastric pain is excruciating, but usually not associated with muscular rigidity. There is a marked collapse and the patient may die of shock. Katsch and Friedrich[14] emphasized that radiation of pain to the left in gall-bladder colic is suggestive of pancreatic involvement.

The etiological factor of the inflammatory group is usually a diseased biliary tract due to infection or calculi, or both. The actual cause of the necrosis is the presence of activated pancreatic juice within the substance of the gland. Histologically, we find evidences of inflammation associated with exudates in the ducts and often in the perilobular spaces, as well as widespread necrosis of the parenchyma, which occurs usually in the head and body. Necrosis of fat is a prominent feature of this group. Acute necrosis due to infection from contiguous structures occurs in suppurative peritonitis, portal thrombo-phlebitis, perirenal abscess or an ulcer perforating into the pancreas. Here pancreatitis is found in varying degrees of severity and spreading inwards.

The degenerative group of acute necroses of the pancreas gives a different gross and histological picture, because in these cases there is no evidence of any inflammatory process either in the gland or in the biliary tract. There are also striking differences in the clinical pictures. The group resulting from cardio-vascular disease may be further subdivided on etiological grounds into those due to congestive heart failure, hypertensive arteriosclerosis, or emboli. The other main group depends on a severe toxæmia, resulting in cloudy swelling of all the organs, the pancreas being also affected.

The cardinal clinical features of the congestive heart-failure type are the usual signs of right-sided heart failure, associated with upper

abdominal complaints, especially epigastric pain with nausea and vomiting. The pain which often radiates to either hypochondriac region or to the back is usually severe and accompanied by a marked restlessness. The cardiac collapse may become more prominent. The blood-sugar level rises and is of definite value in the diagnosis. Acute circulatory stasis in the pancreas leads to anoxæmia in the tissues, and this increases its hydrogen-ion content, which may act as a catalytic agent for the activation of trypsinogen. The lipase is not activated and thus fat necrosis does not occur. Another possible factor is the increased permeability of the upper intestinal mucosa due to its extreme congestion and degeneration which promotes the rate and decreases the selectivity of absorption through this mucous surface. Absorption of toxic products from the upper bowel may occur and increases the acute degenerative changes in all the viscera. The pancreas is congested, soft in constituency, with punctate hæmorrhages. Microscopically, these are focal areas of necrosis.

In the hypertensive arteriosclerotic type, or the so-called pancreatic apoplexy, there is a history of a sudden onset of severe epigastric pain occurring in a patient showing generalized arteriosclerosis; this sometimes may be associated with cerebral apoplexy. The hæmorrhages and the concomitant local necrosis in the pancreas are the result of a ruptured vessel due to these sclerotic changes in its wall.

The embolic type is almost invariably associated with subacute bacterial endocarditis, the pancreas sharing in the embolic phenomena. Here the pathological process is an infarction of the gland.

The group of acute necroses depending on general toxic condition is never positively diagnosed clinically. When seen at necropsy the pancreas is extremely necrotic, as are also the other viscera. Brody and Custer[6] find this to occur most frequently in association with the intracranial diseases such as acute alcoholic psychosis, pneumococcic meningitis, epilepsy, paresis, etc. Persistent nausea and vomiting are the most common symptoms and are usually associated with an intense upper abdominal pain. The pancreas is soft and necrotic, with loss of the architecture of the acini. No evidence of inflammation is present.

Opie[19] has described hæmorrhagic and gangrenous pancreatitis with disseminated fat necrosis following abdominal injury in the epigastric region. There is usually a history of a severe blow or kick in the area, with or without injury to the skin.

TUMOURS OF THE PANCREAS

Carcinoma of the pancreas arises usually from the ducts and in about two-thirds of the cases occurs in the head of the gland. It forms a little less than two per cent of all malignant tumours. This tumour is usually scirrhous in type, and is composed of firm fibrous nodules, but occasionally it is soft and cellular or encephaloid. Chronic pancreatitis may deceive the surgeon at the operation into thinking that he is dealing with a cancer. It is frequently associated with carcinoma, but whether this should be regarded as a cause or as an effect it is hard to say. This tumour usually metastasizes late, but when it does the spread is to the lymph nodes.

Due to the fact that the tumour usually arises in the head of the pancreas, the earliest sign of carcinoma is often a severe progressive jaundice from obstruction of the common ducts. It is thus an obstructive type of jaundice. Pain, when found, is due to inflammation around or pressure on the coeliac ganglion. There is a marked anorexia, with a distaste for meats or fats. Here, as well as in other lesions of the pancreas, there is a rapid and excessive loss of weight with extreme weakness.

Tumours of the islets of Langerhans are usually benign adenomas, but in some recent literature malignant changes have been mentioned. The first case which was described by Wilder and his associates[25] showed metastases in the liver. In these cases the first symptoms are usually due to hyperinsulinism or insulin shock. The character of these epileptiform seizures is that they usually occur just before the normal time for taking food, or after a fast. The author feels that whenever a patient complains of convulsions one should inquire about a relationship to the taking of food, and one should estimate the blood sugar, to rule out hypoglycæmia.

HÆMOCHROMATOSIS

Hæmochromatosis, or as originally called "bronzed diabetes," has proved to be a baffling disease. The three essential features in this

condition are cirrhosis of the liver, siderosis of the skin, and diabetes. The essential pathological condition is a deposition in the various tissues and organs of pigments—hæmosiderin and hæmofuscin. Mallory[17] considers that hæmofuscin, which is derived from hæmoglobin, is deposited in the endothelial lining of the sinusoids and the parenchymatous cells. Later, after years, the hæmofuscin is slowly changed into hæmosiderin. The same process occurs in the acinar tissue and the islets of the pancreas. The accumulation of pigment produces a fibrosis with necrosis of the cells. Regeneration occurs to replace the destroyed cells, thus cirrhosis of the liver and pancreas appear. Other organs are similarly affected, taking on a chestnut brown colour; the skin becomes a dusky brown; and the liver and spleen are enlarged. Later, owing to these degenerative changes in the pancreas, diabetes occurs. The essential nature of this condition is obscure, but it is probably due to innate disturbances of iron metabolism with a slow accumulation of iron pigments in the tissue throughout a period of years. This disease thus becomes apparent only late in life. Mallory[17] is of the opinion that the disease is a slow poisoning with copper from the food.

Pancreatic Calculus

Pancreatic calculus is a rare condition. According to Ackman and Ross[1] only 107 cases have been reported in the literature. Pancreatic stones have invariably been located in the ducts, producing obstruction and dilatation. Early there is an interlobular pancreatitis with small round-cell infiltration, and later fibrosis takes place. Calculi here, as elsewhere, are thought to be due to a primary infection, with secondary stasis. The author has seen one case of stones in an accessory pancreas which was located in the mesentery of the transverse colon. This condition is frequently not recognized during life or is confused with gall-bladder colic. The symptoms are similar to those of gall stones, except that the pain is in the left epigastrium and radiates to the left side of the back, and is usually associated with a marked loss of weight.

Summary

Some of the rare and less important conditions as anomalies of development, cysts, tuberculosis, syphilis and rare tumours have been omitted.

1. The author wishes to stress the close relationship between the inflammatory conditions of the gall-bladder, bile ducts and appendix, with those of the pancreas.

2. Poor results following cholecystectomy are usually due either to chronic hepatitis, chronic cholangitis, or chronic pancreatitis.

3. Acute pancreatic necrosis must always be borne in mind in the "acute abdomen."

4. Pancreatic diseases, either inflammatory or malignant in nature, may produce an obstructive type of jaundice.

5. Although to-day we can control diabetes mellitus better than any other condition in the pancreas, we do not know much about the pathological changes producing it. It is probable that when we learn more about the pathological physiology of the islands of Langerhans we will have a better understanding of this disease.

6. We must consider tumour of the islands of Langerhans as a cause of epileptiform seizures.

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GENITO-URINARY TUBERCULOSIS*

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THE subject of chronic genito-urinary tuberculosis is a vast one, and it is impossible here to do more than touch upon the more important points. It is our wish merely to outline the condition, giving, as it were, the high lights leading to a correct diagnosis, and to stress what we believe to be the more important factors in the treatment.

Genito-urinary tuberculosis may be divided for convenience into *genital* and *urinary*, according to its location. Both however may be present.

It is an accepted fact that tuberculosis of the male genital tract is, in the vast majority of cases, secondary, and it is generally agreed that this occurs for the most part through hæmatogenous infection whereby the bacteria are borne from the original site to the secondary lesion by the blood stream. A certain percentage of cases undoubtedly occur through direct extension down the urinary tract from the kidney, ureter and bladder to the prostate. This manner of infection probably accounts for about one-third of the cases. There is considerable controversy, however, as regards the primary site of infection in the genital tract. In many cases the disease is so far advanced that it is impossible to determine this positively. The site which appears to be first involved is the globus minor of the epididymis. However, recent work tends to show that at least in a considerable number of cases the primary hæmatogenous focus is in the seminal vesicles.

To the examiner the lesion first appears as small, hard nodules, readily palpable in the lower pole of the epididymis. From here the lesion spreads to the upper pole and then outward into the surrounding tissue. It then becomes softer, with a tendency to break down, and often eventually breaks through the skin of the scrotum, forming a fistulous track. The spread is then upward, either by means of the lumen of the vas or through the lymphatics and outward, so that the tunica vaginalis becomes thickened and the testicle eventually invaded. Extension to the opposite side may also occur, most likely through lymphatic spread. The extension upward along the vas, most probably through bacteria carried in the lumen, may eventually reach the prostate and seminal vesicles and from this actually extend so as to involve the urinary tract. In those cases in which the original infection is from the kidney downwards, the prostate, as a rule, first shows evidence of the disease.

It is an extraordinary fact that tuberculosis of the male genital tract rarely shows the tendency to complete healing that characterizes the tuberculous lesions of the lungs. It is true that the progress of the disease may be very slow, that it may remain fibrotic for a considerable length of time, with little tendency to coagulation and liquefaction, but it undoubtedly retains the ability to lighten up into active lesions on the least provocation.

The cases of tuberculous prostatitis present no pathognomonic symptoms. Patients usually complain of frequency, urgency, dysuria and at times terminal hæmaturia. On examination, the prostate will be found to be irregular, hard, and nodular, and at times fixed. A great aid in the diagnosis is the presence of nodules in one or both seminal vesicles. The urine will very often show pus and acid-fast bacilli. In the differential diagnosis we must rule out an early carcinoma and prostatic calculi.

The treatment of this condition is hygienic rather than surgical. There has been considerable controversy regarding the removal of a tuberculous prostate. The consensus at the present time is for conservatism.

Tuberculous epididymitis may be either acute or chronic. Many cases have an onset simulating gonorrhœal epididymitis with high fever, severe pain and marked swelling of the epididymis. The majority of them, however, have an incipient onset and present themselves because of swelling in the scrotum with slight pain

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and discomfort. Nearly always the patients trace the beginning of their trouble to some trauma, such as a blow on the testicle, which they had received some time previously.

In the differential diagnosis one must rule out a low grade *non-specific epididymitis, syphilis of the epididymis,* and *spermatocele. Primary tumours* of the epididymis seem to be rare. Of course, the presence of a thickened and beaded vas and of nodules in the prostate and seminal vesicles usually clinches the diagnosis. The presence of a fistulous track in the scrotum leading down to an enlarged epididymis is pathognomonic of the disease.

The treatment of tuberculous epididymitis is both surgical and hygienic. The surgical treatment is either conservative, which we adhere to, or radical. The conservative method consists in removing the diseased epididymis and as much of the vas as possible, with transplantation of the upper end of the stump. The radical treatment consists in removing the epididymis, vas, and seminal vesicle.

Inasmuch as the condition is nearly always well advanced before diagnosis can be made the prognosis in all cases must be guarded. Surprisingly good results are frequently found following general treatment, such as is carried out for tuberculosis in any site. Cases of secondary involvement of the urinary tract, even following surgery, are not uncommon.

Urinary tuberculosis is probably one of the most distressing ailments to which man is subject. It is made much more so by the fact that when the symptoms are severe enough to force the patient to seek advice the disease is often beyond the reach of treatment, and the patient is doomed to a miserable existence until relieved of his suffering by death. Inasmuch as most people consult their family physician at the first sign of illness, on him in the majority of cases rests the responsibility of a diagnosis and the prompt institution of adequate treatment, which, if undertaken early enough, may result in cure.

The disease is never primary in the urinary tract, though in many cases the focus of infection may be obscure and not demonstrable.

There are three possible routes by which the kidney may become infected, the hæmatogenous route, through the lymphatics, and by direct extension.

While it is within the realm of possibility that infection may occur by the second and third routes, in the vast majority of cases it is hæmatogenous in origin. Tuberculosis of the urinary tract always begins in the kidney, and usually in one kidney. It never occurs primarily in the bladder, but spreads to this organ from the affected kidney or prostate. Inasmuch as the onset of symptoms seldom occurs before the bladder has become affected it can readily be seen that in most cases the condition is already well established before the diagnosis can be made.

The patient usually presents himself complaining of frequency and burning on urination. In many cases hæmaturia may be present. There is usually no pain in the kidney region, unless some obstruction exists. Any case in which there is complaint of frequency and burning with pyuria should always be suspected of renal tuberculosis and thoroughly investigated along these lines.

Opinions still remain divided on the question of the passage of tubercle bacilli through normal kidneys. We are of the opinion that the bacillus passes through due to a break in the delicate kidney tissue, a break which may heal almost spontaneously leaving no trace, or which may remain as a permanent lesion, a starting place for a renal tuberculosis. It seems inconceivable to us that organisms can pass or be filtered through tissue leaving no trace of their passage. It may be safely concluded that in suspected cases of renal tuberculosis the finding of the bacillus is confirmatory evidence of the disease.

The diagnosis in most cases is not difficult, because, unfortunately, it is usually the later cases that are seen by the urologist. Inasmuch as the prognosis depends absolutely upon the extent of the lesion it can be readily understood that an early diagnosis is of paramount importance. There are no pathognomonic symptoms.

Tuberculosis of this type does not cause emaciation until very late; on the contrary, the patients are usually robust, in many cases obese, a fact which in itself is misleading to many. The absence of constitutional symptoms, such as fever and chills, is striking. It is only in very rare cases that a daily afternoon fever is found.

While, as stated above, there is no characteristic syndrome, three symptoms and signs demand investigation.

1. Frequency, usually the first thing noted by the patient. The frequency occurs day and

night and increases in severity with the progress of the disease. This is an indication of bladder irritation and decreased bladder capacity.

2. Dysuria, burning, especially on urination, which is associated with the frequency, and in the later stages becomes intense. As the bladder becomes more and more affected its capacity diminishes, its irritability increases, and we are confronted with a most miserable patient who is compelled to void every few minutes, each passage of urine causing him extreme pain.

3. Pyuria is an almost constant finding. It may occur early in the disease, perhaps even before the frequency and dysuria make themselves noticeable.

4. Hæmaturia may or may not be present, but usually manifests itself at some time during the course of the infection. Occasionally it may be the first sign noted. Microscopically, blood can almost always be found in the voided urine.

The finding of the tubercle bacilli in the urine has been mentioned above; it is by no means constant but in the majority of cases the bacillus can be found on careful search. Two methods are used.

In many cases bacteria may be found in a single specimen of urine. The method we employ here is the direct one. A specimen of the voided urine is centrifuged for about half an hour at high speed; the supernatant fluid is decanted, and the sediment is fixed and stained as follows: (1) cover the slide with carbol-fuchsin solution, and heat to steaming for five minutes; (2) pour off stain, and wash in water; (3) decolorize in 5 per cent acid alcohol about 5 minutes until pinkish grey; wash in water; (4) flood in 95 per cent alcohol for 5 minutes; wash in water; (5) counterstain with brilliant green for one minute. Wash in water, dry and mount.

We also employ the so-called tannic acid method. For this purpose a 24-hour specimen is necessary. The specimen is acidified with a few drops of 30 per cent acetic acid, and to every litre of urine 2 c.c. of 5 per cent tannic acid is added. The specimen is then stored in the ice box for 24 hours. During this time a heavy precipitate is formed, which settles to the bottom of the bottle. The supernatant fluid is then decanted, and the sediment is centrifuged for 2 minutes at high speed. This second supernatant fluid is decanted and the sediment is treated with 1 c.c. of normal sodium hydroxide, and is completely dissolved. After digestion, water is added to fill the tube. It is again centrifuged and the third supernatant fluid is decanted. The sediment is then spread over clean glass slides, a drop of normal hydrochloric acid is added, and the smear is fixed by heat. Staining is by the direct carbol-fuchsin method described above.

Patience and persistence may be necessary, and often a long search must be made before the investigator is rewarded by finding the tubercle bacilli. Failing this, the urine may be injected into guinea pigs. At the end of six weeks the pig is killed and carefully autopsied. Inasmuch as this procedure is time-consuming, we do not resort to it often. In most cases the diagnosis is made without it.

The tubercle bacilli cause lesions in all parts of the kidney. The French school recognizes miliary tuberculosis, nodular tuberculosis, ulcerocavernous tuberculosis, tuberculous hydronephrosis and tuberculous nephritis. It seems satisfactory to consider three main types, acute miliary, chronic or surgical, and toxic tuberculous nephritis. With lowered resistance and active processes, the kidneys may be showered with generalized tuberculous lesions which offer no hope for restoration of function or cure. Between these two extremes is chronic tuberculosis.

In this paper we have not considered the acute miliary type, since it is a part of generalized tuberculosis and offers no hope of surgical cure. Nor have we discussed toxic tuberculous nephritis, which may be either a part of general tuberculosis or secondary to a tuberculous mate. In the latter instance, the nephritis usually subsides after the removal of the tuberculous organ. A study of a series of kidneys removed at operation in our service for tuberculosis indicates in a general way the following paths of infection.

1. *Cortex.*—The bacilli entering the kidney by the blood stream gain a foothold in the loops of the glomeruli or in the capillary circulation supplying the tubules. Thus there are formed small primary tubercles which spread, fuse and generally caseate, extending to the medulla. Any injury of the endothelial cells, either traumatic or toxic, combined with the mechanical conditions of the circulation, favours a foothold for virulent bacilli.

2. *Medulla.*—The earliest lesions seen in this

zone appear frequently at or near the apices of the pyramids (excretory type). Tubercle bacilli which are discharged into the tubules are at this point exposed to stagnation, and possibly the action of crystalline substances, etc., in concentrated form, may easily damage the epithelium. In this region we have frequently demonstrated stasis in normal kidneys. Blood and excretory infection may be combined.

3. *Pelvis.*—Here the lesions apparently begin in the submucosa, the bacilli being brought by the blood or lymph route and gaining access owing to local conditions of lowered resistance, as in the other types. Pelvic infections may, however, also become secondary to the entrance of cheesy masses with bacilli from the cortex to the medulla. It must be remembered that these statements are very general, and made only from observations on operable cases, that is on cases in which a diagnosis of unilateral involvement only was carried out and in which a good prognosis seemed justified.

The initial lesions are the typical tubercle formations. The subsequent history depends on the virulence of the bacilli and the local resistance. As a rule, in the cortex multiple small foci form which spread and coalesce. In the medulla the pelvis usually becomes early involved and the kidneys may be reinfected, giving the picture of an ascending infection. This is also the picture when the pelvis is the starting point. Finally, all parts of the kidney, pelvis, medulla, and cortex become involved, and it must be understood that a great percentage of the kidneys removed show this advanced stage in which it is no longer possible to venture even a guess at the location of the point of entrance of the bacilli.

Once the diagnosis of renal tuberculosis has been made, the services of a urologist are indicated. The closest cooperation between the general practitioner and the urologist is necessary if a good result is to be effected. To the latter belongs the problems of accurate diagnosis and localization of the lesion with the immediate treatment and necessary surgery; upon the former falls the longer and infinitely more irksome task of long carefully supervised general treatment.

To determine the function many tests have been devised, perhaps the best known of which is the phenolsulphonephthalein test.

At cystoscopy inspection of the bladder will often confirm the diagnosis. The characteristic inflammation around the trigone and ureteral orifices, with or without ulceration, is significant. Often this inspection may give a clue to the involved kidney. If tuberculosis is present there may be inflammation round one or both ureteral orifices, and they may be retracted, the characteristic "golf hole" ureter, a result of inflammation and shortening of the ureter with retraction of the orifice.

The next step is the investigation of the kidneys and ureters themselves. This is done by passing catheters to each kidney pelvis. Specimens of urine are then collected and may be examined for the presence of pus and the tubercle bacillus. Differential function tests may be done by injecting the dye intravenously at the time of cystoscopy and collecting ureteral specimens which are examined in a similar manner. Pyelograms are now taken, using 12 per cent sodium iodide as a medium. In some cases intravenous pyelography is helpful. The pyelo-ureterogram is of great value, as in many cases the ureter itself gives a clue to the diagnosis.

The picture in a tuberculous kidney shows more or less hydronephrosis with infection. The calyces are blurred and indistinct, and have a characteristic fuzzy or moth-eaten appearance. Calcification may be present in the kidney, and when seen is of some value. Three conditions only will produce calcification of the kidney, viz., renal calculi, sarcomata and tuberculosis.

The ureters show more or less inflammation and the typical case will show resulting multiple strictures. While single ureteral strictures are not uncommon, resulting from trauma, it is rare to find multiple ureteral strictures in the absence of tuberculosis.

Occasionally it is impossible to catheterize the ureters, either because of strictures, or, more rarely, occlusion, the so-called auto-nephrectomy. In the latter case the kidney is functionless and acts merely as a focus of infection. Where the ureters cannot be catheterized intravenous pyelography may be resorted to. However, inasmuch as the results obtained here depend directly on the kidney function the procedure is not so valuable in tuberculosis as in obstructive lesions of the urinary tract. A uroselectan series will, however, give valuable information regarding the kidney function.

Thus, after all tests have been made one

should know the extent of the lesion and the function of both kidneys. It is hardly necessary to state that the general condition of the patient must also be carefully considered. It is advisable to search for possible foci of infection, and, since the most common focus is to be found in the chest, a thorough routine physical examination, including x-ray of the chest, should be done in all cases.

Having collected all possible data regarding both the local and general condition of the patient we are confronted with the problem of treatment. The following conditions lend themselves to surgical treatment.

1. Cases in which the disease is confined to one kidney. It has been shown that with the removal of the diseased kidney, and possibly the ureter, the bladder condition clears up quite rapidly in early cases, and symptoms are much alleviated. It must not be forgotten, however, that as the disease progresses there is a definite decrease in bladder capacity due to contraction of that organ. Thus, while the dysuria may be relieved by removal of the infected kidney, the patient will always have more or less frequency because of the lessened bladder capacity.

2. Cases showing involvement of both kidneys do not admit of surgical interference, except where drainage or removal of a septic focus is indicated, and here the treatment is only palliative. Such cases must be treated along the lines laid down for the treatment of tuberculosis generally. These consist briefly in fresh air, sunlight, plenty of good nourishing food, and as much rest as possible. Inasmuch as absolute or even adequate rest of the kidneys is impossible, the prognosis is not good. Yet we have seen patients with advanced bilateral involvement who lived for many years. Usually there is in addition to the tuberculosis a mixed infection which results sooner or later in almost complete destruction of the kidney.

Regarding the surgical treatment of the corresponding ureter, we remove that portion of the ureter that, if left alone, will act as a focus. We do not routinely remove the entire ureter down to the bladder.

It is of the utmost importance to realize that the treatment must not cease with the discharge of the patient from hospital. General treatment must be instituted for at least six months, consisting in rest, sunlight, and nourishing food. It is advisable to keep the patient under observation for a considerable length of time. Thus it will be seen that the treatment, in the last analysis, resolves itself into the treatment of tuberculosis anywhere. Far too many cases are operated upon, discharged from hospital, and sent on their way to carry out their normal mode of living. It must be clearly understood that rest is as necessary in the treatment of renal tuberculosis as in the treatment of pulmonary tuberculosis.

The prognosis depends of course on the activity and extent of the involvement. When both kidneys are affected cure is in the majority of cases practically hopeless. True, spontaneous cures have been reported, but they are rare.

A study of the records from the Department of Urology at the Royal Victoria Hospital, Montreal, shows that renal tuberculosis comprises about one-half of one per cent of all admissions on that service. This figure agrees with those of other centres.

As a matter of interest we have studied the records in 100 consecutive cases of renal tuberculosis on our service. While we realize that this series is too small to be of value for accurate statistics, nevertheless, we believe the findings to be of considerable interest. In accordance with the general aim of this paper, we have studied these cases only as regards their symptoms, and the findings resulting from the various investigations carried out in order to make the diagnosis.

Of the 100 cases, 60 occurred in males, and 40 in females, a ratio of three to two. The oldest patient was sixty-two years of age; the youngest eleven years; the average age for the series was thirty-three years. The duration of the symptoms varied from one month to twenty-three years, the average duration being three years.

Frequency was the symptom most commonly complained of, and was present in 80 cases. Dysuria was next, and was present in 60 cases. In order of incidence were back pain, present in 51 cases; hæmaturia in 40 cases; urgency in 22 cases; loss of weight in 14 cases; suprapubic discomfort or pain in 13 cases; loss of strength in 10 cases; fever and chills in 7 cases; night sweats in 5 cases; epigastric pain and difficult urination, each in 3 cases; nausea and vomiting and chest pain, each in 2 cases; and cough in 1 case only. Five cases in the series had no symp-

toms, the condition being suspected on examination of the urine for life insurance.

Sixty-five cases showed unilateral involvement of the kidneys, 40 being on the right side and 25 on the left. In 35 cases both kidneys were found to be involved.

Pulmonary tuberculosis in varying stages from healed quiescent lesions to active involvement, was found in 60 cases. Genital tuberculosis was associated in 20 cases in the following sites.

Epididymis	13
Prostate	10
Seminal vesicles	7
Urethra	3
Fallopian tubes	3

Other sites were involved in the following cases.

Hip joint	2
Elbow	1
Spine	1
Larynx	1
Meninges	1
Peritoneum	1

Examination of the bladder urine disclosed the presence of pus in 94 cases, blood in 49, while the tubercle bacillus was found in 53.

Cystoscopies are reported in 80 cases. In these a positive diagnosis was made by examination of the bladder mucosa in 62; in 18 cases which proved to be renal tuberculosis, the bladder appeared normal. Examination of the ureteral orifices led to a positive diagnosis in 69; in 11, which later proved to be tuberculosis, both orifices appeared normal. Pyelograms or uroselectan studies were reported in 42 cases; of these 38 were positively diagnosed as tuberculosis, and 4 appeared normal.

Guinea-pig inoculations were done in 11 cases. Five were reported positive and 6 negative. In the 6 negative cases the tubercle bacillus was found previously in the urine of 3, and the involved ureter was completely obstructed in 2. In 9 other cases the involved ureter was completely obstructed and no specimen could be obtained.

Of the 65 unilateral cases, nephrectomy was done in 47, thirty on the right kidney and 17 on the left.

I wish to thank Professor Oertel and Dr. Waugh, of the Department of Pathology, McGill University, and Dr. Petroff, of the Trudeau Sanatorium, for valuable assistance in this work.

CHOLINE AS RELATED TO LABOUR*

BY FRANK WALKER, M.A., M.D. AND D. NELSON HENDERSON, M.B.,

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AN investigation of choline as related to labour in the human being has been carried on during the past two and one-half years in the Department of Obstetrics and Gynæcology, under the direction of Professor W. D. Hendry. The results of this investigation, with a few comments on them, are reported in this paper.

Choline is found in the blood of the umbilical cord and probably in all living cells. The commonest source is the cortex of the adrenal gland, choline being nine times as common in the cortex as in the medulla.[1] Choline is a parasympathetic stimulant which causes increased salivation, bronchial spasm, increased intestinal peristalsis, and a fall in blood pressure. The effect of choline on the uterus is by no means definite, different results having been reported for the uteri of different animal species; similarly, different results have been reported of its effect on the isolated organ, as compared with the uterus *in vivo*, and in the pregnant and non-pregnant uterus of the same species. Barger states that choline has a stimulant effect on the isolated uterus resembling that of physostigmine somewhat closely.[2]

There is an antagonism between choline and adrenalin, choline inhibiting the reaction of adrenalin in regard to bronchial spasm, heart rate and blood pressure. Goldzieher[1] states that it takes one mg. of choline to counteract the blood-pressure raising effect of one quarter mg. of adrenalin. Hartmann and Aaron report a case which shows that the stimulant for adrenalin secretion is dependent on the activity of the cortex of the adrenal gland. This stimulant is probably choline. In other words, as the amount of blood adrenalin rises, the quantity of choline rises to neutralize its effect. Gautrelet claims that choline disappears from the blood on the administration of atropine, further em-

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phasizing the antagonistic reaction between choline and adrenalin. Goldzieher was able to isolate one mg. of choline per c.c. of blood from the suprarenal vein, but when pilocarpine was administered the quantity of choline from the same source rose to the high concentration of 1.9 mg. per c.c. of blood.

Choline chloride is the common form and has a formula $C_5H_{14}ONCL$. Several derivatives of choline, more powerful in their physiological effect, have been studied by Von Oettingen and Eveleth.[3] They are more powerful in their action as compared to choline chloride in the following ratio—choline hydrochloride 1; choline dichloride 1.5; di-choline dichloride 2.6; and the methyl and ethyl amino-choline compounds 2.6 and 3.4, respectively. The last two substances are more toxic than the others and affect the skeletal muscles. The side-chain that is added to choline to produce the first of these last two substances is similar to that found in methyl guanidine, which brings about a reaction similar to eclampsia. Choline seems to be the mother substance for these derivatives. Choline probably acts as the chloride to produce physiological effects and these more powerful derivatives are only formed where the physiological demand is too great to be met by choline in the form of chloride. In other words, if an emergency arises, such as a very high blood pressure which cannot be met by the available choline chloride, then one of these more powerful derivatives may be formed to meet the sudden demand. Hunt and Renshaw have demonstrated still other choline derivatives with varying physiological effects.[4] A familiar derivative is acetylcholine, a very powerful blood pressure depressor, which is present in small quantities in ergot. Our investigations have been confined to choline chloride.

For the purpose of this investigation, the choline content of the blood from the umbilical cord was estimated. As soon as the umbilical cord was cut, the placental end was inserted into a graduate and 40 c.c. of blood collected. The method of isolation and estimation of the choline content of blood used by us will be found at the end of the paper. Suffice it to say here that measured quantities of choline chloride were repeatedly added to blood and allowed to go through a similar process to that which the blood alone was subjected. About 95 per cent of this choline chloride was always recovered by our method.

For the purpose of correlating the duration of labour and the choline content of cord blood, 282 estimations were made. This relationship is shown in Table I.

TABLE I

RELATION OF CHOLINE CHLORIDE TO THE DURATION OF LABOUR

Choline Chloride per 100 c.c. of cord blood	*Duration of Labour*	*Number of Cases*
PRIMIPARÆ		
5.3 mg.	10 hrs. and under	59
4.4 mg.	Over 10 hrs.	65
MULTIPARÆ		
5.4 mg.	10 hrs. and under	109
3.5 mg.	Over 10 hrs.	49

This Table shows the 282 cases divided into two groups, primiparæ and multiparæ. It is seen that for both groups the average choline estimations were higher in labours under ten hours' duration than in those over ten hours' duration. Our explanation of this is that the greater concentration of choline stimulates the uterus to stronger contractions and thus reduces the duration of labour. It is worthy of note that the lowest concentration of choline (3.5 mg.) was obtained in labours of over ten hours' duration in multiparæ, where the dynamic factor is so important in labour.

In those cases where the maternal blood was also examined, it was found that the choline chloride content of maternal venous blood was considerably lower than that of cord blood obtained from the same patient at the same time.

Having in mind the antagonistic reaction between adrenaline and choline, particularly in regard to blood pressure, it was decided to correlate blood pressure with the choline content of cord blood. Before doing this, however, it seemed advisable to discover whether any relationship existed between blood pressure and duration of labour. For this purpose the blood pressure in one thousand cases admitted to the Burnside Maternity Hospital between the years 1920 and 1924, was correlated with the duration of labour for each case. This correlation is shown in the first part of Table II.

It will be seen that for primiparæ the duration of labour varies directly with the blood pressure up to 130 mm., while for multiparæ the

increase stops at 120 mm. From this series of 1,000 cases it seems that blood pressure has some definite relationship to the duration of labour. This is made further evident when the second group of cases in the same Table is compared with the first. The larger series was obtained from the records of blood pressure on admission between the years 1920 to 1924. The last group was obtained during the past twelve months, but these blood pressures were taken during the first stage of labour. Both show a similar relationship between blood pressure and duration of labour in primiparæ. The discrepancy for the multiparæ in the last group is probably due, firstly, to the few cases in this last series, and, secondly, because the relationship is not so definite for multiparæ as primiparæ. This relationship of blood pressure and duration of labour can be explained in part by the theory that the blood pressure is due to adrenalin present in the maternal blood in increasing quantities as indicated by the systolic pressure. This adrenalin seems to have a depressor action on the uterine muscle, resulting in weaker uterine contractions and longer labours. Our explanation of the decreased duration of labour when the blood pressure is over 130 mm. will be offered later.

TABLE II

RELATIONSHIP OF BLOOD PRESSURE TO DURATION OF LABOUR

1,000 CASES FROM HISTORY RECORDS

PRIMIPARÆ

Systolic B.P.	*Duration of Labour*	*Number of Cases*
110 and under	10.3 hrs.	88
111 to 120	12.3 "	114
121 to 130	13.1 "	111
131 and over	12.5 "	102
MULTIPARÆ		
110 and under	7.3 hrs.	133
111 to 120	8.9 "	187
121 to 130	8.6 "	150
131 and over	8.5 "	115

252 CASES FROM PRESENT SERIES

PRIMIPARÆ

Systolic B.P.	*Duration of Labour*	*Number of Cases*
110 and under	11.5 hrs.	46
111 to 120	16.0 "	40
121 to 130	21.0 "	14
131 and over	11.7 "	21
MULTIPARÆ		
110 and under	8.8 hrs.	36
111 to 120	9.2 "	45
121 to 130	9.4 "	26
131 and over	10.4 "	24

Choline estimations of cord blood were also obtained on this last group of 252 cases where the systolic blood pressure was taken during the first stage of labour. The relation of blood pressure to the average choline content of cord blood is shown in Table III.

This Table shows that the concentration of choline chloride in cord blood increases directly with increase of blood pressure. This relationship substantiates the suggestion of Goldzieher that increased adrenalin secretion calls for increased secretion of choline. Here it will be necessary to recall the double function of choline chloride made evident from this study, viz., first, to counteract the depressor effect of adrenalin, and, secondly, to stimulate the uterus. On re-arrangement of these cases in Table III into low labour and high labour duration groups almost identical results were obtained as shown in Table I. Cases therefore with low labour duration have a comparatively low blood pressure and a comparatively high choline chloride content in cord blood. In other words, *when less choline is required to neutralize the adrenalin effect, more is available to stimulate the uterus.* Similarly, where the adrenalin is high, causing raised blood pressure, a large amount of choline is required to counteract the effect of this adrenalin, and less is therefore available to stimulate the uterus.

TABLE III

RELATIONSHIP OF CHOLINE CHLORIDE TO BLOOD PRESSURE

PRIMIPARÆ

Systolic B.P.	*Choline Chloride per 100 c.c. of cord blood*	*Number of Cases*
110 and under	4.4 mg.	46
111 to 120	6.4 mg.	40
121 to 130	6.6 mg.	14
131 and over	6.4 mg.	21
MULTIPARÆ		
110 and under	5.2 mg.	36
111 to 120	5.5 mg.	45
121 to 130	5.8 mg.	26
131 and over	5.6 mg.	24

In both multiparæ and primiparæ when the blood pressure is over 130 mm. there is a drop in both the choline content of cord blood and the duration of labour, which is the opposite of the expected result. It would appear that some other factor enters into this group. When the blood pressure is over 130 many cases are pre-

sumably or frankly toxic, and such cases frequently have short labours. In these cases of high blood pressure choline chloride is probably not available in sufficient quantities to neutralize the effects of the adrenalin present, and physiologically more powerful choline derivatives are formed as an emergency measure. If the two amino-choline derivatives with their toxic properties and effect on skeletal muscle are formed, an interesting speculation arises as to the rôle played by these substances in cases of toxæmia of pregnancy with high blood pressure and convulsions. Conversely, at the end of pregnancy, with the high concentration of choline in cord blood, adrenalin will increase. Thus the rise in blood pressure so frequently noted during the last part of pregnancy may be a result of this antagonistic reaction between adrenalin and choline. High adrenalin concentration is probably a compensatory factor to prevent premature labour, which might follow an abnormally high choline content of the maternal blood stream.

THE METHOD OF ISOLATION OF CHOLINE CHLORIDE FROM CORD BLOOD

Forty c.c. of placental blood were collected from the umbilical cord into 10 c.c. of a 2 per cent solution of sodium citrate. This blood was precipitated by a weak solution of tri-chloracetic acid and filtered. The filtrate was reduced by boiling to about 5 c.c. and dissolved in 20 c.c. of 95 per cent alcohol. This solution was then filtered while warm into a test tube containing 0.5 c.c. of a saturated alcoholic solution of mercuric chloride. After being shaken, it was kept on ice for at least 24 hours. While still ice-cold the solution was poured over a filter filled with cracked ice. The filter was then kept supplied with ice and washed with ice-water until the filtrate was mercury-free. The ice was then removed and the precipitate washed with boiling water. This final filtrate was titrated for mercury by Van Slyke's method.[5] The estimations were repeatedly checked by nitrogen estimations, and only those cases were used which fell within the scope of those verified by nitrogen reports.

Blood from 50 cases was precipitated by alcohol and nitrogen estimations made on the final filtrate. These results proved to be almost identical with those obtained when the blood was precipitated by trichlor-acetic acid. Blood so precipitated, however, filtered very slowly and as a result the acid method of precipitation was used.

CONCLUSIONS

1. The average choline chloride content of cord blood is higher in cases having a labour duration under ten hours than in those over ten hours.

2. The duration of labour increased directly with the blood pressure up to 130 mm. systolic, for primiparæ, and 120 for multiparæ.

3. The choline chloride content of the umbilical cord blood increases directly with increased blood pressure up to 130 mm. systolic.

4. Choline chloride is present in greater concentration in the blood of the umbilical cord than in maternal blood of the same patient.

5. Choline chloride seems to have two functions in labour, first, neutralization of adrenalin and second, stimulation of the uterus.

We wish to extend our appreciation to Prof. W. B. Hendry, Prof. V. J. Harding, Dr. H. D. Kay and E. J. King, for their cooperation in this investigation.

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CANCER-LIKE LESIONS OF THE UTERINE CERVIX.—TeLinde states that he has observed several uteri which have been removed unnecessarily because of an uncertain histological diagnosis of a lesion of the uterine cervix diagnosed erroneously as "precancerous." For a lesion to be considered "precancerous" it must be established that the incidence of carcinoma developing in such cases is greater than that of carcinoma in persons free from such a lesion. As an example of a lesion now definitely recognized as precancerous one might cite leukoplakia of the vulva. A review of the literature reveals many reports of cancer-like lesions of the cervix. As has been repeatedly emphasized by Meyer, the question of whether a lesion is malignant or benign can be determined only by the patient's subsequent clinical course. The author presents a series of twenty-four such cases followed clinically and feels that the results are of value in determining whether or not any of these cancer-like lesions subsequently developed into actual cancer and whether the term precancerous may properly be applied to them. The material on which his study is based is derived from histological lesions encountered in the routine examination of cervical tissue coming to the laboratory. The microscopically suspicious lesions were found in twelve instances in cervical polyps which were simply twisted off, no attempt being made to remove the tissue radically about the base of the polyp. The lesions were accidentally found in tissue removed at trachelorrhaphy in three and at amputation of the cervix in one case. In one instance the tissue was removed for biopsy of a suspicious cervical lesion and in one instance by curettage. In six cases the routine examination of cervices removed by panhysterectomy showed cancer-like lesions. From all such cases several blocks were cut and several sections studied from each block in an attempt to find unmistakable cancer in the same cervix, with the idea, particularly, of tracing continuity between the cancer-like lesions and true cancer. In none of the instances was definite microscopic cancer encountered. In this way the author has attempted not only to check up his histological diagnoses but also to learn the true significance of questionable cervical lesions. There was no evidence that any of these patients subsequently developed carcinoma of the cervix.—*J. Am. M. Ass.*, 1933, **101**: 1211.

THE RELIEF OF PAIN IN LABOUR WITH NEMBUTAL*

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AS a result of the sin of our first parent it was said to her, "I will greatly multiply thy sorrow and thy conception; in sorrow thou shalt bring forth children; and thy desire shall be to thy husband, and he shall rule over thee." (Gen. III: 16). And again in I Timothy II: 15, we find, "Notwithstanding, she shall be saved in childbearing, if they continue in faith and charity and holiness with sobriety."

Down through the ages parturition and pain have been synonymous, and it is only within comparatively recent years that a serious attempt has been made to relieve the pains and anguish of labour. For many years opium and its derivatives held the field. Chloral hydrate has been used frequently, especially in Great Britain. Ether and chloroform have been used extensively since their introduction, especially in the late second stage. Nitrous oxide and ethylene serve a useful purpose, but are expensive and call for the services of a skilled anæsthetist. Steinbuchel, in 1902, conceived the idea of using a combination of morphine and scopolamine, as he had seen it used in surgery. It remained, however, for Krönig and Gauss, in 1906, to stress the importance of producing amnesia, and not analgesia, as recommended by the previous writer, a very important point commonly still misunderstood. Gwathmey's synergestic anæsthesia has had numerous advocates in recent years, but here again morphine is employed, together with 50 per cent magnesium sulphate, and a rectal injection of oil, ether, quinine, and novocaine, which all too often is expelled. Until recent years, my preference has been the use of repeated doses of scopolamine, with one small initial dose of morphine, usually grs. 1/6, together with gas, or a combination of chloroform and ether in the late second stage. In hundreds of cases in which this procedure has been followed with great relief to the mother I have never felt perfectly confident as to the possible condition of the fetus. The depressing effect of morphine on the respiratory centre seems to be accentuated in the fetus, and many are born in oligopnœa and a few in asphyxia, even though a single small dose has been given several hours previously.

Since the introduction of the short-acting barbiturates, amytal, pernocton and nembutal, a new enthusiasm has arisen, and many glowing tributes have been paid to the older of these preparations, and I may be accused rightly of adding tinder to the fire. Before doing so, may I be permitted to sound a few words of warning?

1. Much remains to be learned about the use and action of nembutal.

2. No new drug should be used indiscriminately in obstetrics, which is exemplified by the fact that the free and easy manner in which morphine and scopolamine was first used resulted in a large number of babies being born asphyxiated and the drugs fell into disrepute.

3. Although a definite method of procedure is laid down, individuality is the secret of success; the dose must fit the patient and not the patient the dose.

4. Any drug used for the relief of pain in labour should fill the following requirements as outlined by Gauss.

With regard to the mother, (*a*) it is necessary to obtain a considerable reduction of pain—a reduction perceptible to the patient; (*b*) disagreeable secondary effects should not occur, but, if unavoidably occurring, they should not injure the patient, nor be out of proportion to the degree of alleviation obtained; (*c*) especially must there be no considerable disturbance of the subjective state of health of the mother (nausea, etc.); (*d*) the regular birth-process must not be interfered with by unfavourably influencing the muscular action, the bearing-down, the after-pains, or the function of any organ during nursing or involution.

The child must not be injured during intra-uterine life, or during extra-uterine life, *i.e.*,

* Read at the Annual Meeting of the Manitoba Medical Association, September 9, 1932.

at the beginning of its new functions, in the course of the first few weeks, or in its later developments.

I wish to bring forward a preliminary report of 140 full-time confinements in which nembutal was used orally to produce amnesia. The fetus was definitely known to be alive at the onset of the treatment; the cases were taken consecutively, with the exception of those who were delivered rapidly, and other methods of anæsthesia were considered more suitable. They were not picked cases, but contain many instances of mild toxæmia of pregnancy, two cases of mitral stenosis, one of pulmonary tuberculosis, and one of eclampsia. The drug was given orally on account of the simplicity of administration. The reaction is not so quick nor the dose so accurate as in the intravenous administration, but the fact that this drug has a cumulative action reduces the variation in dosage. The barbiturates are highly hypnotic and have a low analgesic efficiency. It is estimated that hypnosis may be obtained by 30 to 50 per cent M.L.D., while analgesia requires 70 to 90 per cent (Ormerod), therefore, amnesia was aimed at, and not analgesia.

The investigation was started eighteen months ago, at which time there was little or no available literature on the use of nembutal in obstetrics. It was a matter of concern, therefore, to ascertain the most suitable dosage and to determine whether there was any deleterious effect on the mother, fetus, or the course of labour. At the outset, nembutal, grs. 3, was employed, repeated every two hours. The initial dose of 3 grs. was not sufficient, and morphine sulphate, grs. 1/6, was added. The addition of morphine had a marked effect on the mother, but was discontinued on account of the marked respiratory effect on the child. Nembutal greatly increases the effect of morphine, even more so than scopolamine or magnesium sulphate, and for this reason should not be used. Chloral hydrate was also used, as recently suggested by O'Sullivan, with a view to relieving the restlessness, but without any definite improvement. It was discontinued in favour of a larger dose of nembutal. The larger dose administered in 24 hours, was 15 grains.

The method now employed is to give a patient of 160 lbs. 6 grs. as an initial dose, a second dose of 3 grs. not later than three hours, and 1½ grs. every succeeding two hours or more, if amnesia is not complete, till delivered. The drug is administered by the mouth in capsule form. The capsules contain 1½ grs. and should be given on an empty stomach, with warm water. They may be given per rectum. The room is darkened, and all unnecessary noises avoided.

Treatment is started in primiparæ when the os is one-third dilated, and in multiparæ when the os is two fingers dilated.

General Effects on the Mother

In about fifteen minutes after the drug is administered by mouth the patient becomes drowsy, and in half an hour, is sleeping soundly between pains. During a contraction the patient may complain, groan or become restless, and then fall off to sleep. If spoken to sharply, she will usually waken sufficiently to respond. The effect of the initial dose will last from 3 to 4 hours. If too great an interval elapses between the first and second dose, the patient will establish "islands of memory," as with morphine and scopolamine. After delivery, the patient sleeps for varying periods, usually two to three hours, and awakes as from a peaceful sleep, noticeably free from post-partum exhaustion, and frequently with the remark, "When am I going to have my baby?" Seventeen of this series were definitely restless, especially during a pain, and for this reason someone should be present with the patient throughout labour.

The pulse rate varied little. In one case there was a definite increase. The greatest fall in blood pressure was 24 mm. hg., the next, 16 mm.; all the rest were less than 10 mm.

Nausea or vomiting was not increased either before or after delivery. Those who did vomit during labour account for a number of the failures in this series. There was no subsequent alimentary disturbance, and constipation was not increased. There was no apparent disturbance in the urinary output.

The Effect on Labour

In this series there were 139 vertex presentations (70 L.O.A., 46 R.O.A., 17 R.O.P., and 6 L.O.P.); there was one anterior parietal presentation. There were 86 primiparæ and 54 multiparæ. The average length of labour in primiparæ was 15 hours, and in multiparæ, 9 hours.

First stage.—There was very little influence on the force and frequency of the pains in this

stage. The interval at first was usually slightly increased, but in some it was definitely decreased, especially in multiparæ.

Second stage.—The majority of cases progressed normally in this stage. In a number of multiparæ this stage seemed definitely shortened, the patients cooperating well. In 73 cases, little or no additional anæsthetic was used. In 40 cases a few drops of chloroform and ether were given to deliver the head. Forceps were used in 32 cases, 22.8 per cent. This may seem high, but as my practice is to employ instrumentation freely in primiparæ when the head has undergone internal rotation, and perineal progress is slow, this accounts for the high percentage. Seventeen such applications were made, and pituitrin was not used *ante partum*.

TABLE I

FORCEPS WERE USED AS FOLLOWS

Total .....32 cases	
Primiparæ .....28: Multiparæ	4
Contracted pelvis	1
Large baby	2
Manual rotation of occiput and subsequent forceps	11
Delay on the perineum	17
Pulmonary tuberculosis	1
	32

Third stage.—This stage was normal. There was no interference with contraction or retraction of the uterine muscle. The average blood-loss of 140 cases was 4½ ounces, by actual measurement. There were four atonic post-partum hæmorrhages, 1 of 30 ounces, and 3 of 20 ounces each. There were 2 traumatic hæmorrhages of 20 ounces each. Two adherent placentæ were removed manually. There were no other retained placentæ.

THE EFFECT ON THE CHILD

In 123 cases the child showed no departure from normal. The respiratory function was established without assistance and the colour was good. This was in marked contrast to the scopolamine and morphine method under which many were born in oligopnœa. There was only one case of severe asphyxia, following a long dry labour, normally delivered with a marked caput. There were no stillborn fetuses, but one died the third day *post partum*.

There was no obvious after-effect on the child. They all nursed well, had a normal initial loss of weight, and the subsequent gain was normal. There was no urinary or intestinal disturbance.

TABLE II

17 CASES WITH SOME DEGREE OF RESPIRATORY EMBARRASSMENT

6 oligopnœic: all these had morphine with nembutal.
10 asphyxia livida (mild asphyxia)
- 6 forceps deliveries.
- 1 forceps delivery and long second stage.
- 1 relatively short cord, wound tightly around body.
- 1 occult prolapsed cord, caught in flexed elbow.
- 1 normal delivery; no demonstrable cause.

1 asphyxia pallida (severe asphyxia)
- 1 long dry labour; normal delivery; marked caput.

Stillborn.—0.
Died after delivery.—1.
- An eight-hour normal delivery, primipara; baby nursed well for 48 hours, then died with a subtentorial hæmorrhage.

THE EFFECT ON THE PUERPERIUM

The processes of lactation and involution were unaffected. There were no abnormal fluctuations in temperature, as has been described in animals. The urinary output was normal. There was no subsequent nausea or vomiting, and the intestinal behaviour was normal. The outstanding feature of this period was the feeling of well-being, and the rapidity of convalescence. This I attribute to the elimination of nervous tension and of fear of the ordeal ahead, so common in the parturient of to-day.

TABLE III

THE RESULTS

	Cases	*Percentage*
Excellent	73	52.1
Good	40	28.5
Fair	16	11.4
Failure	11	8.
Restless	17	12.1

Excellent.—The patient remembers nothing; amnesia complete.

Good.—The patient remembers a few isolated incidents, such as being lifted on to the stretcher.

Fair.—Incomplete amnesia; many "islands of memory."

Failure.—The patient remembers most of her labour. A number of these vomited shortly after taking the drug.

CONTRAINDICATIONS

Cases of respiratory obstruction, respiratory infections, asthma, low blood-pressure, and of serious damage to cardiovascular system and kidney.

CONCLUSIONS

With nembutal we have (1) a simple method of relieving the pains of labour; (2) a high percentage of efficiency, with a minimum risk to the mother and no risk to the fetus; (3) little or no interference with the course of labour; (4) no increased blood loss; (5) a greatly improved convalescence.

ON SOME ASPECTS OF PSORIASIS*

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Montreal

PSORIASIS is a chronic, occasionally acute, inflammatory disease of the skin. The clinical characteristics of aggregated silvery-like scales on an inflammatory base, with its very constant light-to-deep-red background, renders, as a rule, the diagnosis quite easy and distinct from any other skin condition. The disease has been recognized as an entity from early Biblical days.

Our knowledge of specific etiological factors in epithelial diseases such as carcinoma, varicella, verrucæ, etc., is so meagre that it is not surprising that we have not, as yet, any real facts as to the cause of psoriasis. The disease has not so far been reproduced experimentally. Many support the view that psoriasis is an external infectious disease—bacteria, fungi and yeast organisms have been found and thought to be the cause of the disease. More recently, a monilia has been isolated from the skin lesions and also from the bowel contents, but it has not been proved to be other than a chance association. Erasmus Wilson and many others, notably the French school, have believed that psoriasis was due to an attenuated syphilis—it is so held by many to-day—as a manifestation of syphilis at one time present in the family tree. There is no evidence of a direct nature to support such a view. Others again have held to a metabolic disturbance, but while metabolic disturbances are found at times in association with psoriasis, there is as yet no constant finding in this regard and, it therefore may be disregarded. It must be remembered, however, that in a few patients definite metabolic or other constitutional disturbances may closely affect the severity of, or may even precipitate, an attack of psoriasis. We have certain reactions in the skin in response to stimuli—thus there is the eczematous type of reaction towards known stimuli, and here, for instance, in response to linear traumatic stimuli, we evoke an eczematous response. An analogous phenomenon occurs in psoriasis; this has been called the phenomenon of Koebner. During a certain period in the evolution of psoriasis we may evoke a typical linear psoriasis as a result of cutaneous excoriations. Recently Bizzozero[1] determined in a series of experiments that the traumatic excitation acted directly on the papillary layer; it was further noted that a certain incubation period was present before the development of psoriasis, and that this period was a variable one in different individuals. This, then, suggests that in psoriatic patients some biochemical substance or substances are formed, which, coming into contact with the basal or Malpighian cells of the epidermis through the blood or lymph stream, by their action interfere with the normal evolution of epidermal cells. Therefore we have the histological picture of psoriasis, namely, a vascular dilatation in the papillary body, œdema and hypertrophy of the epidermis, along with a faulty keratinization, which is called parakeratosis. This, clinically, is manifested by an inflammatory picture and the so-called silvery scales of psoriasis. It would seem that individuals never acquire a permanent immunity to this reaction, hence the rare, or frequent, recurrences (as the case may be) of this condition. It may, therefore, be easily seen how associated conditions may easily influence the course of the disease, such as metabolic disturbances, and general constitutional dyscrasias, such as anæmia, malnutrition, gout, arthritis, and also mental and nervous worries. Heredity does not seem to be of great importance—it is true that we occasionally see family trees showing psoriatic tendencies—the vast bulk of the patients do not give any history of psoriasis in their ancestors. It would, further, seem that endocrine disturbances clinically are not, as a rule, present; however, Richter,[2] by a series of metabolic and other tests, believed that he found evidence of metabolic disturbances in 65 per cent of cases investigated.

I am concerned here, chiefly, with regard to the care and treatment of the many variations of this psoriatic process, and, for simplicity's

* Read at the annual meeting of the Ontario Medical Association, Hamilton, June 1, 1933.

1. BIZZOZERO, *Ann. de Dermat. & Syphilol.*, 1932, **7**: 510.
2. RICHTER, *Dermat. Wchnschr.*, 1932, **95**: 1597.

sake, I may deal with these under certain headings.

1. *The acute, early psoriasis:* the type which is most commonly observed in children, and at times in adults; a generalized eruption made up of pin-point to pea-sized, slightly-red papules, topped by the fine silvery scale. Here caution is necessary. At this period of its evolution, Koebner's phenomenon is easily elicited, and the patient's skin is hyperactive. It is unwise to use strong irritants such as chrysarobin, for fear of the production of an acute exfoliative dermatitis. Mild local applications, such as a 2 per cent salicylic acid ointment, or a cream containing 12½ per cent Liq. Carb. Deterg., are frequently all that is necessary. Internally the use of salicylates is advantageous, and, in these cases, at times, the administration of small doses of thyroid substance is of value.

2. *The recurrent generalized psoriasis:* in this case the patient has had psoriasis at intervals for years—the lesions are large or small plaques, widely distributed over the body, scalp, face sometimes, trunk, arms, thighs, legs; scaling is frequently excessive and the lesions are thickened to a variable degree. Itching is not uncommonly present. Here, chrysarobin has been a standard remedy. It may be used in ointment form, ranging from 2 to 20 per cent. I like the preparation called Dreuw's ointment:

℞

	Per cent
Chrysarobini	20
Ol. Rusci	20
Ac. Salicylici	10
Sapon. Mollis	25
Paraffini. Mollis Alb.	25

This should be applied at night and washed off in the morning. Better still, if possible, admit the patient to hospital, where it may be rubbed in and applied constantly, day and night. The attack is generally overcome in four to five weeks. It is to be noted that all cases do not respond and frequently other forms of treatment are needed. Here, particularly in the hospitalized patient various forms of foreign protein therapy are indicated. Autohæmotherapy has rarely shown itself of value. Injections of whole milk intramuscularly often seem to hasten the process of evolution. Where the patient is hospitalized, or confined to bed, the intravenous injection of typhoid vaccine once every five or six days is of greater value and may be recommended. Certain drugs seem to be of value, although not uniformly so. Arsenic, an old remedy, may be given either by mouth as Fowler's solution, or as subcutaneous injection in the form of sodium cacodylate. Of the two, I believe, where tolerated, that liq. arsenicalis is of more value. The intravenous injection of sodium salicylate has occasionally cleared up an otherwise obstinate psoriasis. Campbell and Frost,[3] in 1930, reported with enthusiasm on a series of cases treated with injections of 10 per cent suspension of psoriatic scales—a number of observers since that time utilizing this method have not been able to confirm the results.

The use of chrysarobin is usually objectionable, and we have tried to eliminate it entirely in the treatment of psoriasis. At the same time, the application of a reducing substance is nearly always necessary, irrespective of any associated therapy. For some years we have been accustomed to use an ointment (Ung. Hyd. Oleat Co., of the Montreal General Hospital Pharmacopeia), which has the following ingredients:

℞

	Per cent
Hyd. Oleat	12½
Liq. Carb. Deterg.	12½
Ac. Salicylici	12½
Ol. Ricini	12½
Paraffini Mollis	50
Ol. Ros. Geran.	Min. V.

It has the advantage of not staining the skin, is easily applied to any part of the body and, unless an individual is sensitive to tar or mercury, is well tolerated and is to be recommended. In conjunction with its use locally we have tried to evaluate the use of gold salts. This is given in the form of gold sodium thiosulphate, intravenously, dissolved in 5 to 10 c.c. distilled water, in doses of 25 to 100 mg. It should not be used in those cases in which there is any constitutional disease, such as nephritis, anæmia, marked arteriosclerosis, or active tuberculosis of the lungs. It is advisable to start with 25 mg. and when it is not well tolerated, as evidenced by an adverse generalized reaction following injection, or the slightest manifestation of irritation of the skin, which usually starts with an erythema, the drug should not be used. If well tolerated, 50 to 100 mg. may be given twice weekly. We have been using gold sodium thiosulphate for the past year in the treatment of psoriasis. It is an empirical remedy, and it would seem to act by rendering

3. FROST, *Arch. of Dermat.*, 1930, **22:** 685.

the skin more sensitive to the use of local applications such as tar, etc., and, therefore, should always be used in combination with such measures. It is not specific; numerous cases that we have treated have failed to show improvement. On the other hand, we have noted that many cases of florid psoriasis, with a markedly generalized eruption do very well under such treatment, whereas the cases of psoriasis showing sparse, fixed areas of involvement rarely show much change. Further, it would seem that, like other remedies, the individual may become immune after prolonged use. The following instances of its use may be cited.

CASE 1

D.M., female, aged 26. Psoriasis of 13 years' duration. Had had numerous generalized attacks of psoriasis and has been previously treated with arsenic medication, chrysarobin externally, and x-ray therapy. Present attack had lasted for two years and she had not responded to any form of treatment during that time. Under the use of ung. hyd. oleat co., locally, and gold sodium thiosulphate 100 mg. twice weekly over 6 weeks' time, condition entirely disappeared. During that time patient gained weight and general health was greatly improved. Recurrence developed six months after cessation of treatment.

CASE 2

M.P., female, aged 23. Psoriasis since 6 or 7 years of age. Had had frequent recurrent attacks of generalized psoriasis, and had not cleared up under varied treatment in the past 2 years. She showed numerous thickened patches over the scalp, face, body, thighs and arms. Under ung. hyd. oleat co. and gold sodium thiosulphate, 100 mg. twice weekly over a period of two months, the psoriasis totally cleared up. A very mild recurrence developed four months later, with a few odd patches scattered over the body and scalp.

CASE 3

P.J.F., female, aged 35. First seen in 1927 with a history of psoriasis of the scalp for five years, and at that time there had developed numerous lesions over the body. Under various treatments, including ultra-violet light, sod. cacodylate by injection, chrysarobin, foreign protein, she has been cleared up partially during numerous widespread attacks. In November, 1932, large plaques were prominent on face, scalp, body, arms and legs. Gold therapy was started, along with ung. hyd. oleat co. locally. At the end of three weeks' treatment she developed urticarial lesions, apparently as a result of the injections. This subsided following cessation of the gold therapy, and the lesions rapidly disappeared, with the exception of the small patch on the knee and on the scalp. Following three x-ray exposures, these entirely disappeared. She showed a slight recurrence in three months' time.

CASE 4

F.D.K., female, aged 38. Marked psoriasis on legs and arms, present for 2 years. After five injections of gold sodium thiosulphate she developed an urticarial reaction and following this there was complete disappearance of the eruption. She used ung. hyd. oleat co. locally. Slight recurrence followed in two months' time.

CASE 5

D.H., female, aged 45. History of psoriasis over 21 years. At time of presentation she showed large plaques over most of the body, which were irritable. She was given four injections of gold sodium thiosulphate, with the use of ung. hyd. oleat co. locally, with the result that the condition completely subsided.

CASE 6

R.N.W., male, aged 45. In 1928 patient developed a thickened eruption on the palms of the hands with fissuring. In 1921, under various ointments, x-ray therapy, and arsenical medication, he failed to clear up, although greatly improved. The condition persisted. He was seen again in October, 1932, when gold sodium thiosulphate, 100 mg. twice weekly, was given over a period of two months' time, along with the use of ung. hyd. oleat co. and x-ray therapy. In December, 1932, all traces of eruption had entirely disappeared and the palms were perfectly normal. He has since remained clear.

CASE 7

F.R., female, aged 42. Marked psoriasis for 15 years; had been observed and followed for 10 years, and during this time had had extremely severe, generalized attacks, with very thick plaques scattered over the body. Admitted to hospital in November, 1931, and failed to respond to any form of treatment over a period of four months, which included chrysarobin and tar locally, autohæmotherapy, typhoid injections intravenously, ultra-violet light therapy, etc. In April, 1932, was given gold sodium thiosulphate intravenously, and along with a mild tar preparation locally, in the course of two months entirely cleared up. Eight months later the condition recurred, and, although not hospitalized, the patient was given gold sodium thiosulphate again in large doses, without any appreciable improvement.

It may be again emphasized that the use of gold salts in the treatment of generalized psoriasis is purely an empirical one, and, further, that it should be used with the greatest of caution and only in the physically fit patient; reactions quite akin to those following arsphenamine injections may follow its use.

3. *Fixed localized types.*—Here we are dealing with patches of psoriasis which are localized in a few areas and remain stationary over a long period of time. Here, again, a local application, such as Druew's ointment or ung. hyd. oleat co., may be used. It is this type that fails to respond, as a rule, to general medicinal measures such as gold, foreign protein therapy, etc. Here a valuable method of treatment in conjunction with ointment treatment is the use of x-ray. This may be given in weekly exposures, beginning with ½ skin unit and continuing with ¼ skin unit over a period of 5 to 6 weeks. If involution does not result, it is unwise to persist with the use of x-ray therapy. It is always advisable that x-ray treatments should be given with caution; the patient should be told of the form of therapy. It must be remembered that this is a recurrent condition, and prolonged x-ray treatment may be the cause of superficial or deep x-ray lesions. The patients should, therefore, be selected, as the results frequently are so quickly obtained that the patient may feel the

need of frequent treatment on the slightest sign of a recurrence.

4. *Psoriasis of the nails.*—This is not uncommon, either limited to the nails, or in association with psoriasis elsewhere. These cases respond slowly. Ointment as a local application is of little value. X-ray is the treatment of choice, and may be given best at long intervals. Dr. Howard Fox of New York recommends ¾ skin unit once monthly, and I have found it of great value. The clearing-up generally takes 4 to 6 months. I think here small doses of Fowler's solution by mouth are of distinct value.

5. *Interval therapy.*—Having cleared up this picture, I confess usually we wait for a recurrence—sooner or later. However, it seems to me that ultra-violet therapy is of distinct value here. Most of the time this is impossible; the financial and other aspects of such treatment make it difficult. Dr. Omar Wilson, of Ottawa, has pointed out the infrequency of recurrences when this can be adhered to. Failing that, treatment by means of direct sunlight, as far as possible, is to be advised. Some years ago a patient of mine, subject to previous and numerous attacks of psoriasis, went to the tropics for three years, where he became constantly exposed. He was entirely free while there. Two months after his return he had a severe recurrence.

I may sum up by saying that there is no specific treatment for psoriasis. At the same time, the judicious use of the local and internal remedies, of which there are many, will make the sufferers from this, at times, disabling disease much more comfortable and able to carry on their daily work.

THE CANCER PROBLEM AND PUBLICITY*

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V

IN placing before you reasons why I think it imperative for us to organize a thorough publicity campaign against cancer, regardless of whether we reach any measure of success, it would seem wise to review the situation as it stands to-day.

The time has arrived when we should frankly face the entire question. Statistics show us that to-day more than 125,000 people on this continent die from cancer each year, and we have reasons to suspect that these figures are increasing. This may be partly due to more accurate records being kept and as the result of progress in medical science more people are surviving until the cancer age, but, even taking this into account, cancer appears to be increasing to an alarming extent. No amount of optimism can overlook the fact that the cause of cancer is still dismally in the dark, and honesty compels us to acknowledge our limitations and how distinctly meagre are the lasting curative results being obtained by any form of treatment. Whether or not we are actually losing ground I am not prepared to admit, but we are certainly becoming more aware how limited are our successes and how very much more there is to do before we can say that we have control of this dread disease. All those specifically concerned with the cancer problem are aware of the tremendous difficulties facing us, and, whilst we are clearing the way for further important work and sweeping aside some of the many theories put forth, it becomes necessary for us all to recognize the magnitude of the task still before us. Whilst research work in the most competent hands must go forward as never before, the question we might well ask clinicians is "Just how far are we availing ourselves of and putting to the most effective use the means already at hand?"

It scarcely seems urgent for the general practitioner who sees only two or three cases a year to keep abreast of all that is known on the subject, particularly when most of the cases coming to him arrive too late. Even in a general hospital only a small percentage of

* Previous articles in this series can be found in the *Journal* as follows:— 1933, **29:** 465; 1934, **30:** 46, 48, and 50.

admissions are cancer patients and we can see immediately the difficulty of training our general practitioners; without them our hope probably lies in concentrating a large number of cancer cases in a special institution in order that research and education may go hand in hand with the best therapy. Where such an institution is available it would be a simple matter for the physician who wishes to possess exact knowledge pertaining to tumours to go and see for himself, to attend at the consultations when the diagnoses are made, and then to follow the cases through to the surgical and radio-therapeutical departments or, maybe, to autopsy. Carefully written histories and follow-up records, over a period of years, would not only bring many facts to light but would give a more exact interest, develop a keener diagnostic acumen, and enrich the medical attendant's evaluation of the earliest manifestations of malignancy.

More and more cures with the means already at hand, rather than undue emphasis on experimental work, should be our keynote to-day. Much more can be done with the means already at our disposal than is imagined, and a more accurate and persistent recording of our clinical observations will give weight to this such as no other method can hope to accomplish. It is our privilege and duty to turn the known facts to account and leave no stone unturned that will assist the present situation.

It is not my purpose to discuss in any way the much debated and various methods of treatment, except to say that only by pooling our knowledge can we hope to obtain adequate results. We are seeing on every hand and in every sphere of life, socially and economically, a greater sense of collective responsibility and action. The day of the individualist is gone, at least for the time being. Many of the changes we are witnessing to-day, however much we may resent them, are necessary and inevitable. In no sphere is this more true than in the field of medicine. Our work is too vast for any one man to be able to keep abreast of it, and there are so many angles of approach that unless we are prepared to realize our own human limitations and to make a collective contribution in our work we cannot hope to be really effective. The general practitioner, the surgeon, the internist, the pathologist, the radiologist, the statistician and the research man are all intrinsic parts of the whole, all highly important, and no true measure of success can possibly be obtained without a due recognition of this fact. We view the almost limitless possibility opening up in the field of science—one hundred new avenues of approach—and only the Group or Clinic could ever hope to bring that vista within the practical horizon and in strict correlation serve the public to advantage. It might be greatly to the interests of the family doctor if he were to recognize this much more than is being done to-day, and how impossible it is to find time and energy to cover the whole field for himself.

In the matter of cancer we are faced with several weaknesses. Early diagnosis with inadequate treatment is just as fruitless as late diagnosis and good treatment. It is a matter for cooperation all along the line and without this our best efforts may prove of no avail. Comment, of course, has been created because of dilatory treatment by some members of our profession who do not attach sufficient importance to early symptoms and by such delay greatly endanger the patient's life.

But if it be true that we need to recognize more the relationship of all those within the profession, it is also true that we need even more to educate the public to better cooperation with us. That there is still the odour of the magician about a good deal of our professional atmosphere we must admit, and we can scarcely blame the public if they oft-times doubt the mysteries hidden behind our careful silences. Medicine has fully graduated out of the dark secretive era which was a remnant of astrology and the magic of the Dark Ages, and it is high time that we realize the ability of the public to see through the ominous caste we have created. Certainly in this field of cancer we cannot hope to obtain the results we might without a much closer bond with the public. We are in no position to vacillate over professionalism when such a bond is essential for results if we wish to obtain a lower mortality rate. So long as the public is willing to neglect early symptoms and to continue conditions of living which develop irritation and overstrain, so long we may expect the situation to be most difficult. The people must be brought to realize the seriousness of delay in medical examination of all abnormal conditions and the absolute necessity of regular examinations of all those who appear

predisposed to cancer, or those over thirty-five years of age. This cannot be possible without adequately informing the public and making them aware of the danger attending negligence and delay.

Should the public be made cancer-conscious? This seems to be a debatable question, but in my opinion the old bugbear that "publicity would stampede the public," no longer holds good. Where it has been tried it has met with splendid success and justified itself beyond all serious criticism. There is no more convincing argument favouring publicity than that it has been tried in England, United States, and several of the other leading nations, with splendid response and amazing success. The whole idea that the public is not to be trusted "goes by the wall." Confidence will breed confidence. It has been shown that where publicity has been tested, out of one thousand responses of people seeking anxiously to know whether the symptoms of which they complained were cancerous, 5 per cent were found to be in that condition; 15 per cent revealed other diseases; and the balance were assured of a normal condition. Surely such results were worthwhile.

In many of the advanced sections of the world we find the provinces, states and cities distributing pamphlets, exhibiting placards, developing radio and public lectures enabling the public to learn all the necessary facts concerning the subject. The response has more than warranted the experiment. A systematic approach, say once a year, by a competent lecturer over the air or before every club and institute in Canada would soon end the ignorance now displayed, often terminating in fatal results for our patients. We must be prepared to teach the public the accepted facts regarding cancer; the necessity of early, prompt and adequate treatment in order to dispel certain wide-spread misconceptions and to give to all the opportunity to cooperate with us.

Moreover publicity is advisable if we wish to obtain the necessary financial support for any progressive movement and particularly the cancer movement. We shall also need the substantial assistance of civic, provincial and federal authorities, as the indirect cost to the community at present is much larger than is generally recognized. We might reasonably expect that anything done to lessen this cost would be properly compensated for by corresponding support of such a movement. In any event a definite move will have to be made to interest all those public bodies, financially able to contribute, so that there would be no possibility of failure through lack of funds. There is the cost of medical care to the patient and the influence of cancer upon the civic and domestic life of the afflicted. Every physician must be aware of cases coming to him, particularly from the country, when the visit has been delayed past all hope of cure simply through fear of expense; expense not only of the hospital medical advice and treatment but of also travelling. Therefore I repeat that we must enlist the support and cooperation of all governments and financial institutions capable of assisting in this most desirable and needy communal activity.

There are other matters requiring thought and action, but as a discussion of these does not come under the caption of this paper I will simply mention a few, such as (1) the enforcement of standardized hospital methods for securing and recording of histories and follow-up information; (2) public clinics for examination, diagnosis, treatment, advice, and possibly the administration of treatment; (3) surgical study with a view to formulating definite ideas upon the question "When is radical excision of cancerous growths advisable?" or, "When is the 'surgery of access' to be recommended to facilitate irradiation treatment?" (4) adequate radium and x-ray equipment to be used in the treatment of the cancer patients in centres convenient to the largest number of people, such treatment to be administered by qualified and experienced radiologists only; (5) the education of the family physician in order that he may be ever on the alert for the earliest manifestations of cancer and be enthused sufficiently to prepare and keep for future reference well-written records of his observations. (6) My final thought, requiring more consideration than I have space for, relates to post-mortems. There are two important objects: (a) the securing of tissue for biopsy to enable grading and typing of the carcinoma or sarcoma; and (b) the discovery of metastases (location and number). There must be some procedure acceptable to all parties concerned for obtaining autopsies.

It is obvious that, to succeed, such a wide-spread movement will need the endorsement and

support of the entire medical profession. We cannot go forward without it. Although progress in the handling of cancer patients during the first thirty-two years of this century is recognized as praiseworthy, still even the results to-day are far from satisfactory and justify some radical change of approach to the entire subject if we hope to improve the situation. Greater cooperation within the profession and concerted publicity without would do much to overcome our present distressing weaknesses in the field of cancer.

THE DIAGNOSIS OF CANCER OF THE STOMACH*

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Toronto

VI

AS a rule when a patient suffering from cancer of the stomach presents himself to the surgeon the diagnosis is comparatively easy, for he is complaining of *loss of "pep," loss of appetite,* and *loss of weight* — three cardinal symptoms of a well-advanced carcinoma of the stomach, *but not of the early case.*

The patient who consults his doctor before this trinity of symptoms has developed is a more complex problem. The history must be gone into very carefully. Not infrequently he complains of "indigestion". Care must be taken to discover what is really meant by this term, as the pathology is unknown. It must be discovered how this "indigestion" affects the patient. Is it a sense of fullness behind the sternum? Is it pain in the epigastric region after meals? Is it belching of gas after meals? If the pain comes on soon after meals the condition is more likely to be *gastric ulcer;* if two or three hours later, it may be *duodenal ulcer.* Pain rarely, if ever, occurs in cancer of the stomach, either early or late. The "indigestion" may be eructations of gas; if associated with this there is discomfort behind the sternum, the case must be carefully analyzed to determine whether it may be *angina* or *cancer.* A long-standing history of "indigestion" suggests ulcer rather than cancer, unless perchance cancer becomes engrafted upon an old ulcer, when it will be found that while for years the man has had pain after meals he now has a sense of discomfort only.

Fortunate indeed is the patient who, if he is to develop cancer, has it occur at the pyloric ring, because then he will seek advice early, for he will early develop signs of obstruction. It is important then that a diagnosis be made early, for cancer in this situation metastasizes early and no time should be lost in adopting radical measures. At the same time it is well to remember that only about 7 per cent develop at the pyloric ring, while about 90 per cent develop in the pyloric antrum and along the lesser curvature, and only about 3 per cent at the cardiac end. If cancer happens to begin close to the œsophageal opening the patient will come complaining of some difficulty, or a queer sensation, in swallowing. When the growth develops in what may be called the silent area of the cardia the diagnosis is extremely difficult and can only be made with the assistance of a painstaking and efficient roentgenologist.

When a careful history has been analyzed then it is time to begin the examination. The patient is placed upon a table with the head and shoulders slightly elevated and the knees flexed, which means that the thighs are also flexed. An inspection will sometimes reveal a lump in the epigastric region, or it may be observed that there is visible peristalsis. As a rule the abdomen is scalloped. Upon palpation the lump may be readily mapped out. If this lump is tender it is more likely to be due to an old calloused ulcer than to cancer, and, if such, there is likely to be in the history a record of blood in the vomitus or in the stools, as well as a prolonged history of symptoms referable to the stomach. In cancer vomiting is not an early symptom, but when it is present it is likely to occur at the end of the day. The existence of a lump does not mean, as is so often taught, that the case is hopeless.

It is now time to discover whether the anæmia that is present is a secondary anæmia due to cancer or ulcer, or whether it is a *pernicious*

* Preceding articles in this series can be found in the *Journal,* 1933, **29:** 465; 1934, **30:** 46, 48, 50 and 168.

anæmia with gastric symptoms. A careful blood examination will clear this up.

Occasionally a small, but highly active, *hyperplastic goitre* has to be differentiated, because here there is loss of weight, some anæmia, and weakness, but the careful history and a thorough examination will discover the real condition.

There are no definite early signs or symptoms of cancer of the stomach *per se*. For instance, a man who has not complained to his family or to his doctor is suddenly taken ill with signs of a perforation of the stomach. Upon investigation a cancerous growth that has perforated will be found, most commonly along the greater curvature. If, on the other hand, a patient has complained of symptoms referable to his stomach, and upon further examination and x-ray it is found that there is a lesion along the greater curvature, it is wise to deal with this as a cancer until it is proved otherwise, for nine times out of ten a lesion here will turn out to be cancer.

It is essential, therefore, to make a comprehensive survey of any case to determine whether it is cancer or *duodenal ulcer with obstruction, gastric ulcer, pancreatitis,* or *cholecystitis;* and that is one of the reasons why so much stress is laid upon a very thorough history, not merely of the present condition but extending over a period of years.

Not infrequently a cancer begins in the transverse colon and by contact invades and perforates the stomach, or *vice versa*. The diagnosis of this condition is readily cleared up by a barium meal and a barium enema, followed by an x-ray examination for confirmation.

A case in point occurred last winter, when a man sought advice from his doctor because of a massive hæmorrhage from the bowel. At this time a mass could be felt under the left costal border. During the examination the patient vomited fæcal matter. A barium enema was resorted to after the hæmorrhage was controlled, and under the fluoroscope the barium could be seen passing from the colon into the stomach. A combined resection of the colon and of the stomach remedied the condition.

Some information is obtained by an examination of the vomitus or a test meal. Usually there is an absence of free hydrochloric acid; occasionally there is an excess; hence too much stress must not be placed upon this. Later in the disease lactic acid may be detected. Sometimes blood is found, and occasionally minute portions of the growth may be discovered.

Some physicians lay great stress upon enlarged glands in the neck as a diagnostic sign. *Such a condition is more an evidence of an impending autopsy;* the cancer has spread along the lymphatics of the lesser curvature to the cœliac group, then to the receptaculum chyli, and from there along the thoracic duct to the neck.

With the history completely analyzed and a careful examination made, it is time to seek the services of the roentgenologist, when, if the case is one of cancer of the stomach, a filling defect will be found, with delay in emptying time. These examinations should be made with the patient in the prone position, otherwise the pressure of the spine upon a flaccid stomach may be mistaken for a filling defect. A filling defect may be caught, even when cancer is present in the cardiac end, by placing the patient in the head-down position, with the body canted a bit to the left.

Cancer of the stomach is not the rare disease that some text-books would lead us to believe, and when the unfortunate doctor hunts for the text-book signs and symptoms he is really looking for the late manifestations of the disease, when much stress is laid upon pain. Rarely is pain an early symptom, because the nerve supply comes from the pneumogastric and the sympathetic, with but few sensory fibres intercommunicating.

One further word. If the clinical picture suggests cancer of the stomach and the roentgenological examination does not confirm the clinical diagnosis, unless perchance some other pathological condition is discovered, it is probably safer to depend upon the clinical findings. If, however, the doctor can be sure of cooperation upon the part of the patient, it may be wise to wait and have a further x-ray examination in from one to three months, but not longer; otherwise the patient may wander off to some of the "drugless healers", to have a vertebra adjusted, and thus think he has had a cure effected while the disease is making slow progress.

THE X-RAY TREATMENT OF CARCINOMA OF THE BREAST*

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Brandon, Man.

XV

THE x-ray treatment of carcinoma of the breast has met with a mixed reception on the part of surgeons. This is due to several reasons, partly to prejudice against a comparatively new form of treatment, partly to unsatisfactory results obtained in a few cases, but mostly to failure to become familiar with recent reports. No candid observer who carefully studies the reports of cases of x-ray treatment, which are now accumulating so rapidly, can fail to recognize the great aid which radiation therapy offers as an adjunct to surgery.

Clash in statistics.—There is a definite clash between the statistics furnished by some surgical clinics and those furnished by radiation-therapy clinics. Some surgical statistics show that radiation therapy, as a supplement to surgery, does not increase the life-duration beyond that afforded by surgery alone. The writer believes this to be a false conclusion, since it is based on incomplete premises. The statistics, as reported by the surgical clinics in question, are not based on a consecutive series of cases, all treated by the combined method of surgery and x-ray; they are based, rather, on those cases of the series in which it was thought advisable to supplement surgery by x-ray. The simple uncomplicated cases were treated by surgery alone, while the advanced cases, those of high grade malignancy, or those in which it was feared that malignant tissue was not completely removed, were given the additional protection that might be afforded by x-ray. If these surgical clinics, instead of comparing the results of surgery alone in favourable cases with those of surgery and radiation in unfavourable cases, had used radiation therapy as a *routine* measure to supplement surgery, they would have found an improvement in their favourable cases, and this, in turn, would have given a larger percentage of "five year cures".

Some statistics.—The following recent statistics are reported in the 1933 Year Book of Radiology.

Wewell, in an analysis of 1,286 cases of breast carcinoma, treated by surgery alone in the Royal Infirmary, Edinburgh, reports 30 per cent of five-year cures. Harrington, in 1,911 cases, reports five-year cures by surgery alone; 71 per cent if no glands were involved, 26 per cent if glands were involved, while if x-ray was used in the gland cases the percentage was increased to 31. Hintze, in reporting figures collected from 11 clinics, gives a five-year cure from surgery alone in 28 per cent, whereas surgery plus radiation gave 38 per cent. The Roentgen-Radium Institute of Berlin, in reporting 1,206 cases treated, gives 34 per cent of five-year cures in 367 cases treated by surgery alone, and 53 per cent in 183 cases treated by operation plus radiation. Burton J. Lee, of the Memorial Hospital, New York City, reports 217 cases. He states that pre-operative and post-operative x-ray treatments have been used in the Memorial Hospital for the last 13 years, and have been effective in reducing recurrences. Pfahler, of Philadelphia, in reporting 1,129 cases at the recent American Congress of Radiology, 1933, reaches this conclusion. "In the post-operative and recurrent group, with axillary glands, more than twice as many may be expected to live over the five-year period when operation is combined with radiation as compared with surgery alone."

THE BIGELOW CLINIC SERIES

For the purpose of contributing to the statistics the writer has reviewed 120 consecutive, unselected cases which have passed through our clinic, all treated by the combined method of surgery and radiation. Of this group 30 cases received operative treatment, but for various reasons, chiefly failure of the patient to co-operate by returning for x-ray treatment, re-

* Read at a meeting of the clinical group of the Manitoba Cancer Relief and Research Institute.

Earlier articles in this series on physiotherapy can be found in the *Journal*, 1932, **27:** 521, 612; 1933, **28:** 30, 182, 246, 392, 521, 602; **29:** 167, 290, 402, 497; 1934, **30:** 24.

ceived little or no x-ray. These cases are not included in the analysis. A further group of 24 cases, treated since 1929, is not included for statistical purposes, since it does not come within the five-year period, which is the usual basis for determining the efficacy of cancer treatment. Reference will be made later to this group, since it presents many features of great encouragement. The remaining cases, 66 in number, are analyzed from the standpoints of prolongation of life beyond the five-year period, the causes of death, and the relation of gland involvement to prognosis.

Questionnaires have been sent out regarding these 66 cases, with the result that 9 remain untraced, leaving 57 cases on which we are able to present authentic information. There are living 19 cases, with a duration of life since treatment was first begun of from 6 to 16 years. In the 38 cases known to be dead there was a life-duration after treatment was first begun of from 1 to 7 years. The number who outlived the five-year period was 7. This total must be added to the number of those still living, to determine the total five-year survival. That is, a total of 19 plus 7, or 26 patients, outlived the five-year period following treatment. This gives a percentage of 46, which about represents the average quoted above from other clinics—from 38 to 53, as against 28 to 34 for surgery alone. Of the 19 cases still living, 10 have lived over 10 years since treatment was first begun. This represents a percentage of 18 for those alive beyond the ten-year period.

As stated above, we have excluded from this analysis the cases treated since 1929. There are some features connected with these recent cases which give great encouragement, embodying, as they do, our most recent ideas regarding treatment. Of the 24 cases treated during the past four years 21 are still living. Six began treatment in 1930 and I is dead; four began in 1931 and 1 is dead; 7 began in 1932 and all are living; 7 began in 1933 and one is dead (a far-advanced ulcerated inoperable case). Compare this with the results in other four-year periods. In the period, 1918-1921, 50 per cent of the patients died within 2 years; in 1922-1925, 40 per cent died within 2 years; in 1926-1929, 30 per cent died within 2 years; and in 1930-1933 only 10 per cent died within the 2 years. This great improvement in mortality statistics is, possibly, due to two reasons. The first is that, owing to the world-wide campaign for the early recognition and treatment of cancer of the breast, the patients were seen earlier in the disease; the second is the improvement in the methods of treatment, especially in the use of the x-ray, and particularly owing to the emphasis recently placed on pre-operative radiation.

The causes of death following carcinoma are: (1) general toxæmia or other accidents following operation—in this series of 120 cases 4 died from this cause; (2) recurrence at the operation site, 10 deaths in this series; (3) metastases, which were responsible for 24 deaths. The sites at which metastases occurred were, the infra- and supra-clavicular and axillary glands 4, spine 4, pelvis 1, hip 3, liver 3, lungs 7, and abdomen 2.

The presence of glands in the axilla or infra- or supra-clavicular areas renders the prognosis exceedingly grave. Of the 38 patients of this series who died, 30 had palpable glands at the time of operation; conversely, of the 19 patients who remain alive after the five-year period, 7 had glands at the time of operation. The presence of glands, therefore, while making the prognosis grave, should not deter the physician from giving the patient the benefit of every known method of treatment, since we cannot tell in advance which will respond favourably.

The treatment employed by us was given in three stages: (1) pre-operative x-ray; (2) operation; (3) post-operative x-ray.

1. *Pre-operative x-ray treatment* is being much emphasized of recent years, and rightly so. To its more frequent use we attribute the improvement in results obtained in recent cases. Bloodgood, in the *Annals of Surgery*, in 1932, and more recently at the American Congress of Radiology, gives pre-operative radiation first place as an adjunct to surgery. Kaplan (New York City Hospitals) states that pre-operative radiation has a real value, since it limits the spread of malignancy. Max Cutler (Michael-Reese Tumour Clinic), in a personal interview with the writer, declared that "pre-operative radiation and surgical removal are the best means we know to-day for the treatment of cancer of the breast."

There are several disadvantages associated with pre-operative radiation. Probably the greatest of these is that the patients feel so much benefit from the radiation treatment that it

often is difficult to get them to return for operation. In the Memorial Hospital this has been overcome by administering the treatment in a couple of days, keeping the patient in hospital, and then operating about the fourth day. One might fear that this sequence of the operation, so close upon the radiation, might interfere with primary union of the operation scar. The Memorial Hospital staff claim, however, that if the radiation does not exceed an erythema dose over the area operated on there is no interference with primary union. We believe, however, that operation should not follow x-ray treatment within ten days or two weeks, as it requires that lapse of time for the x-ray to secure maximum results in the way of depression of cancer cells and occlusion of the smaller blood and lymph channels.

Pre-operative x-ray treatment was first employed by us ten years ago. We found, however, at that time that there was interference with primary healing of the incision, and the method was largely abandoned for a time. Subsequently, however, in consultation with our surgeons, it was decided that the trouble was not with the x-ray but with the surgery. The surgeons decided to avoid all tension on the skin flaps, even to the extent of frequently leaving the area widely open, in order to make it possible to use pre-operative x-ray without interference with healing. They found that, on the average, just as quick healing was secured when the incision was left partly open, with the added advantage that pre-operative x-ray treatment could be resumed. It is from this date that we began to observe a great improvement in our mortality statistics. The writer believes that the cutting-down of our death rate within the first two years after operation, from 50 per cent in the four-year period from 1918 to 1921 to 10 per cent in the four-year period from 1930 to 1933, is very largely due to the use of pre-operative x-ray therapy. We would strongly emphasize the necessity for its use by all surgeons.

2. *Operation.*—It does not lie within the province of a radiologist to discuss methods in surgery. Certain general principles endorsed by our surgeons should however be mentioned here. A biopsy is done in every case. The pathologist is at hand at every operation and a quick report is made on a frozen section. If the diagnosis is malignancy a radical operation is done. The operation of removal begins at the upper end of the axilla, which is thoroughly cleaned out, and the tumour is removed last. This prevents reinfection of the wound with cancer cells. Many radiotherapists would have the surgeon leave the gland area alone, preferring to treat it with x-ray or radium. This, however, does not coincide with our experience. Many of our most brilliant results have been secured in the most advanced cases where glands had to be removed even from the axillary vessels.

3. *Post-operative x-ray.*—Whereas it was the custom formerly in some quarters to decry pre-operative, and advise post-operative, x-ray treatment, recently the advice has been reversed. The post-operative treatment is now being advised against in some quarters and the pre-operative emphasized. We agree with the placing of emphasis upon pre-operative, but would strongly resist the attempt to do away with post-operative radiation. In view of the well-known ability of the x-ray to destroy or retard the growth of tumour tissue, and in view of the fact that there is no way in which the surgeon can determine whether he has removed all the tumour tissue, it certainly becomes the duty of every physician to see that his patient obtains the benefit received from a follow-up treatment by x-ray.

It is our routine custom to x-ray all operative cases of carcinoma of the breast following operation. The first series is given as soon as the patient is sufficiently convalescent to leave the hospital and come to the clinic where all treatments are given. From this early post-operative treatment we have noticed no interference with healing. Each series of treatments covers the operation area, the infra- and supra-clavicular areas, back and front, the axillary area anteriorly, laterally and posteriorly, the dorsal spine and the liver. A second series of treatments is given after a month's interval, a third in another month, a fourth three months later, a fifth six months later, and a sixth a year later. This keeps up supervision for two years.

We believe it to be immaterial whether the type of x-ray used be 130 to 140 kilovolts or 180 to 200 kilovolts. Erskine, in his recent book on radiotherapy, states that 130 to 140 kilovolts will deliver any required dose to any part of the body. This agrees with the writer's experience, and he uses this voltage exclusively. The

commonest type in present use is the 180 kilovolts. This voltage has many advantages, and anyone contemplating the installation of an equipment for x-ray therapy is well advised to make this his selection. However, let no one think that because he has an equipment of lesser voltage that he is not equipped for the x-ray treatment of carcinoma. The chief advantage of the higher voltage consists in the saving of time. The disadvantage of the lower voltage is the longer period of time needed, and the greater number of ports of entry required, to deliver the desired dose at the tumour depth. This prolongation of time has however its advantages, since the increased period of treatment covers a greater number of cycles of cancer-cell mitosis. This increase of time is now being secured by users of the higher voltage through the administration of the total dosage in fractional periods of time covering several days. The pendulum of American radiotherapy is swinging away from the massive dose administered at one sitting (the original German method) to the fractional dose delivered over a longer period of time, the method of which the French radiotherapists are exponents.

There are many promising new developments in the x-ray therapy of malignancy. These, however, are in the experimental stage, and their place is in highly endowed institutions or large cancer centres. The use of the 300 kilovolt, the 500 kilovolt, and more recently the 700 kilovolt machines is receiving favourable consideration. But because the work is still experimental, and because of the great expense of installation, they as yet have no place in the armamentarium of the average radiotherapist. This type of therapy gives promise of challenging pure surgery for supremacy in breast malignancy.

SILICOSIS*

BY J. G. CUNNINGHAM, M.B.,

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SILICOSIS is defined for Workmen's Compensation purposes as fibrosis of the lungs due to the inhalation of silica dust. Under various names, miners' consumption, grinders' phthisis or grinders' rot, and miners' phthisis, this disease complicated with tuberculosis has been known for many centuries. Agricola's work published in 1556 and translated by the Hoovers in 1912 refers to, "dust which penetrates the windpipe and lungs and produces difficulty in breathing. It eats away the lungs and implants consumption in the body. Hence in the Carpathian Mountains, women are found who have married seven husbands all of whom this terrible consumption has carried off to premature death." A similar statement has been made with reference to miners on the Rand in South Africa and zinc and lead miners in the Western Sstates. Riddell and Brink, of the Ontario Department of Health, have shown that tuberculosis is present in the families of silicotic miners with tuberculosis, to at least as great an extent as it is in the contacts of tuberculous non-miners in the same community in Ontario.

Ramazzini in his classic on the "Diseases of Tradesmen", published in 1705, described the inspiration of sharp particles producing cough, asthma and consumption. In recent years, medical attention has been focussed on the importance of dust, and especially of silica dust, through the experience of South African workers with the disease in underground miners on the Rand.

Machine work, as distinct from hand work, is associated with more dust production, but pneumatic machines, common in the last thirty years, have created a dust problem. The magnitude of this problem from the standpoint of mortality and compensation costs and the difficulties associated with its control has led to extensive inquiry in various trades in all industrial countries.

Perhaps all inorganic dusts produce some fibrosis, but Collis by statistical inquiry was led to indicate that the "free silica" (silicon dioxide), content of dust is the determining factor in its importance to health. However, only within the last four or five years has it been recognized that asbestos, a form of magnesium silicate, *i.e.*, silica in combined form, is re-

* Read at the Annual Meeting of the Ontario Medical Association, Hamilton, May 31, 1933.

sponsible for a fibrosis similar to that produced by free silica. Little is known concerning the relative importance of other forms of combined silica. The simultaneous inhalation of other kinds of dust has not been shown to inhibit the effect of free silica. The inhalation of free silica with alkali dust such as occurs in abrasive soap manufacture, is reported to be associated with the very rapid development of lung fibrosis. The findings on examination of a small group of workers with this type of exposure in Ontario do not support this observation.

In the diagnosis of silicosis, indeed of any occupational disease, a history of exposure is essential. In silicosis, this involves information respecting the material used, its particle size, its concentration in air and the time of exposure. Free silica occurs in industry in the form of sand, quartz, granite, chert and ganister, the first three commonly encountered in industrial processes such as hard rock mining, granite cutting, sandstone cutting, sandblasting, porcelain and abrasive soap manufacture, vitreous enamel spraying, moulding and grinding. In addition there are many individual and widely-scattered exposures often occurring where least expected, *e.g.*, in the manufacture of foundry supplies and of stucco or cement. Other suspected substances are constantly being analyzed in the laboratory.

Particles of less than five microns in size and perhaps closer to one micron are the most dangerous, since they are produced in larger numbers and elude the natural protective mechanism to reach the alveolar spaces of the lung. Only the small particles are found in the lung at autopsy. Such particles are considerably smaller than red blood cells and therefore cannot be seen by the unaided eye, so that a cloud of dust from an industrial process may or may not contain fine particles and present a hazard. An apparently small dust exposure may be important if the material is finely divided.

The amount of fine dust is determined by count or by weight—the former preferred. The United States Public Health Service found at Barre, Vermont, that granite workers exposed to a concentration of dust of less than ten million particles under ten microns in size per cubic foot of air, when the dust contained about 35 per cent free silica, did not develop silicosis during the period under observation. Granite cutters in Ontario with an average exposure of forty to fifty million such particles developed silicosis in from twenty to thirty years, while Porcupine miners with something approximating the same exposure required only eleven years, and sandblasters with counts as high as twelve hundred million particles, where protection is not provided may develop the condition in two or three years. Dust counting is a time-consuming process, but the main exposures have been indicated and the Industrial Hygiene Division of the Department of Health in Ontario will upon request assist physicians in determining exposure.

It should be repeated that silica is a very widespread substance and is in common use in industry, so that suspicion of the presence of a pathological condition of the lungs in an industrial worker, should be followed up with detailed inquiry respecting the duration and amount of dust exposure. In estimating the importance of these features of exposure, account must be taken of the fact that considerable variations exist in the individual response to dust inhalation. The upper respiratory passages intercept quantities of dust breathed and mouth-breathers may be at a disadvantage. The fine particles reaching the alveolar spaces are picked up and carried to the lymph channels by phagocytic cells which are thought to be of endothelial origin. The deep and superficial lymphatic systems of the lungs are connected at many points and provide thorough drainage, all directed ultimately to the tracheo-bronchial lymph glands. Dust is carried to these glands, setting up fibrosis and partial obstruction to lymph flow. That dust reaches the hilum early is suggested by autopsy material showing silicotic nodules in the glands while there are still few of them in the lung substance. Gardner, of Saranac Lake, has suggested that fibrosis due to an old healed tuberculosis of the tracheo-bronchial glands may reduce the time required for a superimposed *silica* fibrosis to set up lymphatic obstruction, accumulation of dust in the lung substance and the development of fibrosis in the lung sufficient to cast a shadow in the roentgen ray film. If such is the case, it would help to explain the variation in the length of time required for individuals with comparable exposure to develop the evidences of silicotic fibrosis. Clinical observation led South African workers, a number of years ago, to reject for

underground employment workmen with any roentgen-ray evidence of chest abnormality, including enlarged hilum glands. Their experience seems to have justified this procedure.

The small groups of lymph cells situated at the bifurcations of the bronchial tree and of the blood vessels are looked upon as centres for the later accumulation of dust particles, giving rise to the widespread distribution characteristic of silicotic fibrosis. The nodules produced are composed of hyaline connective tissue arranged in whorl formation. When they reach the size of a millet seed or wheat grain, they cast shadows in the roentgen ray film giving the appearance of mottling. This constitutes the first specific sign of the disease and is called the first stage.

At this stage just described there are, then, a history of exposure, so that age is of some importance, symptoms of cough and shortness of breath, which may be hardly noticeable, and upon examination, decreased chest expansion, varying disability and a roentgen-ray photograph showing increased hilum shadows, increased linear markings and mottling, which appears within the lung substance, and not just as beading along the branches of the bronchial tree. This fine distinction in the roentgen ray is very important and emphasizes the fact that none but the best technique is of any value in this work. In fact, the first stage cannot be diagnosed without the roentgen ray but all clinical findings must be considered. The condition at this stage is likely to be confused only with miliary tuberculosis, as far as roentgen-ray manifestations are concerned. Other clinical findings serve to differentiate them.

As dust inhalation continues and fibrosis increases, cough and shortness of breath also increase. The shadows remain discrete but become larger and more numerous, until in the third stage dyspnœa is extreme, chest pain is common, cough may be very troublesome, chest expansion is almost absent, the percussion note is dull, breath sounds are distant and perhaps high-pitched with shortened inspiration, evidences of consolidation may be present, and there appear in the roentgen ray corresponding conglomerate shadows due to amalgamation of fibrotic areas. These cases frequently terminate with right heart failure and are not common.

Such is the picture presented by uncomplicated silicosis. The condition itself would not be very serious except with such exposures as that produced by sandblasting, were it not for the complications. Of these, tuberculosis is the most important. Not only is the outlook unfavourable when tuberculosis supervenes but its advent may hasten the development of the manifestations of dust inhalation.

In those exposed, by the time the first stage is reached the liability to tuberculosis has increased. In South African experience, of 728 cases of simple silicosis in the first stage detected in 1920 to 1923 and removed from underground, at the end of the sixth year, roughly 25 per cent had progressed to second stage, another 25 per cent to third stage, 18 per cent were dead from silicosis and 5 per cent were dead from other causes, so that at the end of six years only 25 per cent were still in the first stage and most of this progression was due to a complicating tuberculosis.

The reason for this increased liability to the development of tuberculosis in silicotics is unknown. Kettle has shown that necrotic areas produced by subcutaneous implantation of free silica attract and favour the multiplication of tubercle bacilli to a much greater extent than is the case with necrotic areas produced by certain other foreign substances, such as calcium chloride. Dr. R. M. Price, working in Professor Klotz's laboratory at the University of Toronto, has shown that colonies of tubercle bacilli cultured on media containing very small amounts of silicic acid or sodium silicate present a shortened latent period and a more luxuriant growth. Gardner has shown in animals that a healed tuberculosis lesion breaks down and becomes widely disseminated when silica is subsequently inhaled. There is no evidence that the virulence of the organism is increased.

When silicosis is well established before the advent of tuberculosis, the progress of infection is frequently rapid. The individual presents the ordinary clinical manifestations of tuberculosis—cough, loss of weight, fatigue, afternoon rise of temperature, night sweats, and on examination, local evidence of tuberculous disease, while mottling in the roentgen ray becomes fuzzy in outline, with later coalescence of shadows. The patient may be bed-ridden within a few weeks and dead within a few months.

In another group of cases the tendency to the production of massive fibrosis is marked. The roentgen ray reveals conglomerate areas more

often bilateral and roughly symmetrical, with the individual feeling well, out of proportion to the findings. The tuberculosis may be basal rather than apical. These men frequently work steadily for years, then only intermittently, and finally succumb to active tuberculosis. They have commonly sustained a moderate exposure to silica for twenty to thirty years as do granite cutters and moulders. It may be that in these cases tuberculosis has been a factor early in their exposure, so that two agencies producing fibrosis have been at work simultaneously.

When complicated cases reach the physician late in the disease, characteristic roentgen ray evidence of silicosis may be so obscured as to make diagnosis possible only at autopsy. In most cases of silicosis examination of lung sections under polarized light shows the presence of particles said to be silica, and chemical examination detects a very marked increase in the silica content of the ash of the dried lung.

Until a month ago compensation legislation in Ontario took account of this liability to tuberculosis in defining three stages of the disease. The intention was the removal of men from exposure upon the development of the first definite evidence of silicosis, in the hope that tuberculosis might be prevented. However, any benefit that may have been derived from this procedure seems to have been more than outweighed by the economic difficulty associated with loss of employment and consequent living conditions favourable to the development of tuberculosis. So that, now, compensation is paid only when the disease is present and partial or total disability exist. The presence of the disease is a serious matter for the workman and for the industry employing him.

The importance of removing cases of tuberculosis from among workmen with silica dust exposure makes periodical examination of those so exposed very desirable. Provision now exists in Ontario for requiring such examinations in other industries as well as in mining. Department of Health surveys have shown many cases of silicosis in men at work and it is partly to obtain information of this type upon which to base control measures that physicians in Ontario are now required to report cases of industrial disease coming to their attention.

Case Reports

CHARCOAL INTRAVENOUSLY IN A CASE OF SEVERE SEPTICÆMIA*

BY B. F. MACNAUGHTON AND J. W. GERRIE,

Montreal

History.—G.P., a male, aged 13, had an attack of acute left otitis media six months previously, with discharge for one month. The condition cleared and he had been free from trouble until four days prior to admission, when, in the course of an upper respiratory infection, the left ear became acutely painful and the following day discharged spontaneously. He came to the Ear, Nose and Throat Outdoor Clinic on November 18, 1932, and was admitted to the wards for observation.

Physical findings.—The patient was a French-Canadian lad of frail type, oversize for his age, and yet thin. Temperature 99.2°; pulse 88; respirations 22. The ear presented the usual picture of an acute exacerbation of a chronic otitis with mastoid involvement. The drumhead was an angry red, with a moderate amount of discharge from a large anterior perforation. There was slight mastoid tenderness and an enlarged postauricular gland. Hearing was moderately impaired, the audiogram showing a 24.8 per cent hearing loss for speech. The leucocytic count was 7,800. There was evidence of a subsiding upper respiratory infection.

Roentgenograms showed marked sclerosis of the left mastoid. The nasal accessory sinuses were clear.

Progress.—In view of the short history, the evident low-grade type of infection and mild constitutional reaction, palliative treatment and observation seemed indicated. Under ice applications, routine boracic irrigations, etc., for four days however there was no improvement, and surgical intervention was being considered. On the 5th day there was a sharp rise in temperature to 103.3° and pulse to 112. The boy was flushed, the tongue coated, and breathing rapid. It was thought that one of the acute exanthemata, or possibly a pneumonia, was set-

* From the Ear, Nose and Throat Clinic of the Montreal General Hospital.

ting in and that operative interference in the mastoid was contraindicated until this had declared itself. The temperature remained high without fluctuation for four days and neither cough nor rash appeared. There was a leucocytosis of 11,600 and the blood culture was negative. The corrected sedimentation velocity of the blood was 0.5 mm. per minute. On the sixth day, the temperature became very definitely fluctuant, and in the absence of any other findings investigation of the mastoid became imperative. A blood culture taken this day was reported positive for a hæmolytic streptococcus.

On November 29th the mastoid was opened, and aside from being acellular, sclerotic and hæmorrhagic, showed no marked disease. However, the sinus was exposed, revealing an unhealthy condition of its wall with yellowish discoloration and granulations. The opening was enlarged and an apparently healthy sinus uncovered at both ends. As the patient's condition was none too good, with rising rapid pulse and shallow respirations, it was decided to postpone further operation and 500 c.c. of a 10 per cent solution of glucose-saline were given, and later in the day a 250 c.c. blood transfusion, for which is was necessary to cut down on the vein.

The condition continued grave and unimproved and two days later, December 1st, the left jugular and common facial veins were tied off, the jugular being small with negligible pulsation. The lateral sinus was opened and found completely thrombosed far into the horizontal portion and down toward the jugular bulb. A perisinus abscess was opened and considerable pus evacuated. The sinus was packed off tightly with iodoform gauze after bleeding of a sort had been obtained at both ends. In the meantime, a blood culture taken November 30th had quickly produced a luxuriant growth of hæmolytic streptococcus on blood agar plates.

Repeated blood transfusions of 250 c.c. were given, it being necessary to cut down on the vein each time. The mastoid, neck, and transfusion wounds all began to suppurate profusely. A red painful swelling appeared on the dorsum of the left hand and wrist. This was incised on December 6th and hæmolytic streptococcus cultured from the pus evacuated. On the same day he developed an extensive right-sided pleurisy.

About this time, at a clinico-pathological conference, a member of the staff of MacDonald Agricultural College had reported some dramatic results from the intravenous injection of an aqueous suspension of finely divided animal charcoal into animals suffering from staphylococcic and streptococcic infections. A curative effect was also reported on several human beings suffering from boils and carbuncles. As the harmful effects of the injection were nil and the case appeared desperate, it was decided to try this empirical type of therapy. On December 8th, 4 c.c. of this preparation were given intravenously. Over the following three days there was a very definite improvement, the patient feeling better and taking nourishment; his temperature and pulse were less hectic and the wounds showed less suppuration.

Fluid became evident in the right chest, and on December 12th, as there was some respiratory embarrassment, 320 c.c. of a serosanguinous fluid were withdrawn. From this a hæmolytic streptococcus was cultured. Three more metastatic abscesses developed, two on the left forearm and one above the natal fold. All were evacuated and hæmolytic streptococci cultured from the pus. On December 15th, the first negative blood culture was obtained. The blood-transfusion-charcoal therapy was continued, a 250 c.c. blood transfusion being followed by 5 c.c. of the aqueous charcoal suspension. The second one was given on December 15th and followed by improvement for three days.

Severe, spasmodic, productive cough developed. The temperature continued hectic, although somewhat less so and never rising over 103°. On December 31st, roentgenograms of the chest revealed an extensive right-sided pneumothorax. The patient was feeling better, the wounds cleaner, and the chest condition appeared to be now the chief factor.

Transfusion-charcoal treatments were continued on January 3rd, 12th and 17th, but failed to produce the immediate dramatic response of the two previous injections. The patient continued critically ill with a hectic temperature under 103°, excessive diaphoresis, loss of weight, emaciation, dicrotic pulse and a troublesome productive cough. A blood culture taken on January 12th was negative.

About January 15th, after eight weeks of severe streptococcic septicæmia with many complications, there was a definite turn for the better. At this date although he was coughing

and raising some purulent material, yet the chest was everywhere resonant, the breath sounds were vesicular but somewhat enfeebled, and there were a few moist râles over both lower lobes. The heart's action was rapid, but free from any murmurs. He was feeling better and taking fluids well. The wounds started to heal rapidly. The week following January 15th, the temperature never rose over 102° and the pulse 136; the following week it kept under 101° and toward the end of the next week became normal.

On January 31st the following remarkable blood picture, considering the course of the disease, was obtained: red cells 4,480,000; leucocytes 13,550; hæmoglobin 87 per cent. From February 6th, the temperature remained normal. He was placed on Easton's syrup and quartz lamp therapy and allowed up for the first time on February 13th. He was discharged with all wounds healed and no cough on March 8th, and was last seen in the outdoor clinic on April 21st, when he was of normal weight, of good colour and appeared the picture of health.

COMMENT

This case is of interest because of its extreme severity and duration, the multiplicity of complications, the employment of transfusion-charcoal therapy and ultimate recovery. The clinical diagnoses were: acute exacerbation of a chronic otitis media, mastoiditis, perisinus abscess, lateral sinus thrombophlebitis, hæmolytic streptococcic septicæmia, multiple metastatic abscesses, pleurisy with effusion, pneumothorax and productive bronchitis.

The therapy merits special mention, and probably repeated blood transfusions, intravenous charcoal, and careful nursing played equally important parts in the recovery of an apparently hopeless case.

IODERMA FROM AN ASTHMA REMEDY

BY D. E. H. CLEVELAND, M.D., C.M.,
Vancouver

The following report is not made with the object of condemning any particular remedy. I wish to draw attention to the possibility of undesirable and even disastrous results arising from some commonly used preparations, of which an example is furnished here. It is further to be observed that the connection between the symptoms displayed and a medicine which the patient may be taking without his physician's knowledge, or which may even have been ordered by the latter, is sometimes unrecognized.

The patient, a man aged 64, developed a pustular nodule, resembling a stye, on the eyelid about April 1, 1933. In a few days numerous other nodular and suppurative lesions appeared on the arms and face. At the end of a week their number was still increasing, and he felt ill enough to take to bed. Treatment consisted of boric acid fomentations and ammoniated mercury ointment. On April 16 he was described as presenting numerous discrete papules on the face, scalp and hands, and also tumour-like masses of larger nodules, with pustules about them, exhibiting cribriform openings from which pus oozed on pressure. All the lesions gradually increased in size and tended to form aggregations. The patient was very ill and running a temperature of a septic type, ranging between extremes of 98° and 102°. There were few or no rigors . The urine showed a trace of albumin.

Intramuscular injections of sterile milk were started and given thrice daily, and antiphlogistine applied to the lesions. A stock vaccine of staphylococcus and streptococcus was also given, and nephritin administered. On April 24 soreness of the mouth was complained of, and the mucous membrane covering the hard palate was found to be inflamed, reddened and studded with pustules. A mouth-wash was prescribed and the lesions painted with tincture of iodine.

The general condition became steadily worse. The vegetating lesions on the face increased in size, and slight dullness and diminished breath-sounds appeared in the left base; the patient was becoming apathetic and did not converse with visitors. On May 13 *Staph. aureus* was cultivated from smears of the pus from the lesions and a vaccine made. A blood culture showed a growth of the same organism, but it was subsequently concluded that this must have been due to accidental contamination from surface lesions about the site of venipuncture. No results followed the use of the vaccine.

On May 16 in the course of a conversation with the medical attendant over long-distance telephone I remarked that the symptoms were suggestive of an ioderma. He at once recalled that the patient had been subject to asthma, and had been in the habit of taking proprietary remedies for it which might have contained iodides. I advised that if any of these asthma remedies were still being taken they should be

stopped at once, and that the patient be given 100 c.c. of decinormal saline intravenously. Following this the urine should be tested for iodine. Warning was also given that an increase in the amount of albumin in the urine might be expected to follow this. On this date the patient's temperature was 102° (axillary), pulse 128, and respirations 35-55. His general condition was very poor.

Photographs taken about May 14th. The black patches are hæmorrhagic crusts; there was no destruction of the nasal septum or other parts.

The instructions, as given, were carried out on May 17, and on May 18 it was reported by telegram that large quantities of iodine had appeared in the urine, which also contained albumin and some red cells. The condition of the lesions on the hands had been such that the increase in venous pressure during the application of a towel as a tourniquet in making the venipuncture caused blood to spurt from them. On the following day the patient was reported as feeling distinctly better; the temperature was 99°, pulse 105, and respirations 26-30.

On May 21 I had an opportunity of examining the patient. He was in bed, very prostrated and emaciated, rather drowsy, but able to speak and say that he felt better. There were large fungating lesions over the malar eminences, supraorbital regions, the centre of the forehead and frontal areas of the scalp, about the nares and ears, and on the dorsum of the hands. They were well-defined, beefy-red in colour, and still exuding sero-purulent fluid, although this had diminished during the last two days. They gave off a foul odour and were sensitive. The mucous membrane over the roof of the mouth was dry and red, and covered with red punctate elevations. The tongue was slightly shrivelled and dry, but not dirty. There was a sparse eruption of discrete papules and pustules on the legs and arms, and a scant distribution of similar lesions on the trunk; the skin was otherwise soft, smooth and lax. There was no lymphadenopathy.

General supportive measures were maintained and the lesions dressed with borated vaseline. As improvement was steady and rapid, it was not considered that further intravenous saline was necessary. Subsequently, an uneventful recovery was reported.

The following history is important. The patient had suffered from asthma since childhood. Since November, 1931, he had been taking from one to three doses daily of a proprietary preparation called "Felsol." For a month or two before the onset of his skin trouble he had been overworking and having more trouble than usual from his asthma, and had been taking more frequent doses of the remedy. This had continued until stopped by my advice. He had been taking another remedy also, but this was found to contain no halogen compounds.

The formula given in the Extra-Pharmacopeia[1] shows "Felsol" to be a powder, each dose containing Phenazone 0.47, Iodopyrine 0.03, Anilipyrine 0.04, Caffeine 0.1, Ext. Visci Alb. 0.01, and Ext. Brachycladii 0.01. The makers in their advertising literature give the same formula, except that they name the first two ingredients by their more lengthy synonyms, Phenyl - dimethyl - isopyralozone and Phenyl-dimethyl-iodopyralozone.

The eruption in this case was that of a typical fungating ioderma, such as that reported by Eller and Fox[2] in 1931. In the fatal case reported by these authors they were of the opinion that their patient had been sensitized by taking iodized table salt for years, so that an ioderma developed after taking for a short time a tonic containing small amounts of potassium iodide. In the case reported here it is believed that a similar sensitization took place by the use of "Felsol" containing about a half-grain of iodopyrin, taken from one to three times daily over many years.

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Clinical and Laboratory Notes

AN ECONOMICAL ANTISCORBUTIC SUPPLEMENT

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The small and variable amount of vitamin C in cows' milk has made essential the practice, which is now widespread, of adding to infants' diets a supplement containing the antiscorbutic factor. For this purpose orange or tomato juice is in common use. For families subsisting on relief diets the supply of either orange or tomato juice is not an easy matter. Oranges cannot generally be supplied because of their cost. Juice may be prepared from canned tomatoes, but it is not as good a source of vitamin C as is orange juice.

It has been known for years that turnips contain the antiscorbutic vitamin, but it is not generally recognized that their juice, which is easily prepared, is not only low in cost but is most effective. This was suggested by Chick[1] in surveys of nutrition in Vienna at the close of the war, but has since been overlooked. Turnips are generally provided in relief diets; housewives may readily prepare the juice; and the findings to be reported here demonstrate that physicians may with safety recommend it as an antiscorbutic supplement.

For the preparation of the juice a section of turnip is grated on an ordinary household grater, the minced material placed in linen or other cloth, and the juice pressed out. The average amount from a number of turnips has been found to be one cubic centimetre for every two grams of turnips. An ordinary turnip, weighing two pounds, will give fifteen ounces of juice. The juice is sweet and not unpalatable. If desired, its flavour may be improved by the addition of salt, but for infants the pure juice may be used.

The amount of vitamin C in average Canadian turnips has been compared with the amount in lemon juice by feeding experiments on guinea pigs. Two procedures have been employed—the preventive method with animals on the Sherman diet,[2] and the newer curative treatment suggested by Harris.[3] The results demonstrate that turnip juice is as good a source of vitamin C as is lemon juice, which has previously been considered the best food source. A similar result has also been secured by the chemical method of assay described by Birch, Harris and Ray.[4] Moreover it has been found that there is less individual variation in turnips than in lemons.

The following figures, based on current retail prices in Toronto, show the comparative costs of vitamin C obtained from lemon, orange, tomato and turnip juices. In all cases the data are average, both as to cost and as to yield.

Juice	*Vitamin C units in one ounce of juice*	*Vitamin C units for one cent*
Lemon	280	180
Orange	290	220
Tomato purchased as juice	100	170
Tomato prepared from canned tomatoes	152	180
Turnip	280	1100

It is apparent that turnip juice is a cheap source of vitamin C, and is definitely lower in cost than other juices in common use. Moreover it is easily prepared from a vegetable readily obtainable during the winter months. The vitamin C content of the juice does not change in an interval of three hours at room temperature, or in forty-eight hours when it is stored in a refrigerator.

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3. HARRIS, L. J., MILLS, J. I. AND INNES, J. R. M., *The Lancet*, 1932, **2**: 235.
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A CORRECTED SEDIMENTATION TEST

A. C. R. Walton (*J. Lab. & Clin. Med.*, April, 1933, p. 711) describes a method of standardizing the erythrocyte sedimentation test which eliminates certain possible causes of error. Five years' experience with it has convinced him of its accuracy, and he recommends its general adoption. The tubes employed are 6 cm. long and have an internal diameter of 6 mm., the column formed by 1 c.c. of blood in them being 32.5 mm. long. The sides of the tube must be parallel and the lower end flat. No deviation from the perpendicular is permissible while the test is in progress. To 4.5 c.c. of blood is added 0.5 c.c. of a 3.8 per cent solution of sodium citrate; no further dilution of the blood is necessary or advisable. The optimum room temperature is 19° to 23° C.; temperatures above or below this limit induce marked deviations in the result. A red-cell count on this sample is now made so as to ensure that for the actual test there will be at least 2 c.c. of blood, the red cell content of which, after the appropriate addition of plasma, will register an even million figure (six, five or four) of erythrocytes. The sample for testing is taken so that the sedimentation tube will contain 1 c.c. of blood, the content of which is five million cells per c.mm. The tube is corked, and an even suspension of corpuscles is obtained by inverting and rotating it about its long axis. A heated glass rod is used to burst air bubbles. After the tube has stood for one hour the height of clear plasma lying above the column of red cells is measured. A modification of this method is described which requires only 1 c.c. of citrated blood, though the author doubts whether it is so accurate as the first one, and does not advise its use with a cell count below three millions.—Abs. in *Brit. M. J.*

Editorial

THE PREVALENCE OF AMŒBIASIS

THE recent outbreak of amœbic dysentery in Chicago and the dissemination of the disease from that focus over a wide area of the United States has attracted much attention and caused much disquiet, not only in that country but also in Canada. Recent studies in Montreal have brought to light a condition of things that provokes thought and should keep us on the alert.

The impression is not dead yet that amœbic dysentery is an affection of tropical and sub-tropical regions and when found in the temperate zone is an importation. We know, however, from a study of the literature, that fairly numerous cases have been recognized in northern United States during the past thirty years or so and a few in Canada. Some of the patients concerned had not been out of their own country. Craig[1] estimates that four per cent or more of the people in Northern United States have intestinal amœbiasis. As long ago as 1892 Dr. A. Brayton Ball[2] reported a case in Winnipeg in a person who had not been outside of Manitoba, and in 1910 Drs. F. G. Finley and S. B. Wolbach[3] reported one with abscess of the liver which originated in Montreal. Bates[4], in 1925, reported the case of a patient with amœbic dysentery who had never been outside of Canada, and two more in 1929. This suggests, of course, the possibility that amœbiasis could become endemic in the more northern regions, an idea that does not seem unwarranted in the light of recent investigations.

In this issue are to be found two articles by Dr. Annie Porter and Dr. R. H. M. Hardisty, respectively, on the subject of amœbic dysentery and infestation with *Entamœba histolytica*, based, in so far as laboratory investigations were concerned, on a considerable number of patients (139) with various ailments at the Royal Victoria Hospital, Montreal. Twenty-one* patients with amœbic infestation are reported upon, all admitted during 1933, an unusually large number for any one institution, and it is noteworthy that most of them had mild or chronic symptoms and four were "carriers". These latter would not have been discovered, had it not been for a routine examination of the stools. Including some few cases of infestation examined for private practitioners, Dr. Porter has discovered, to date, thirty-two in all. Dr. Hardisty is of the opinion that amœbic infection is quite a common thing, not only in Montreal but in all eastern Canada. This is somewhat alarming, for if he is correct we may in the near future expect a considerable extension of the disease.

With the hope of obtaining information as to the degree of prevalence of amœbic infestation in Canada we have been in communication with certain hospital superintendents, health authorities, clinicians, and laboratory workers in various parts of Canada, for whose assistance we now express our thanks. We have elicited the following facts. During the past three years cases of amœbic dysentery and amœbic infestation have occurred in several of our Provinces. By cities the figures are:—Vancouver, 2; Edmonton, 1; Regina, 6; Winnipeg[5], 6; Toronto,[6,7] 3; Montreal, 32; Saint John, 0; Halifax, 0. From this one would gather that amœbiasis is becoming widespread in Canada. It is probable also that there are many cases of infection which are being undiagnosed. In the United States it has become evident that secondary foci of infection have been established in addition to the original one in Chicago. We may have the same experience in Canada if we do not take precautions. Three of the Canadian cases have been traced to Chicago—one in Van-

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2. BALL, A. B., *Therap. Gaz.*, 1892, **8:** 523.
3. FINLEY, F. G. AND WOLBACH, S. B., *Montreal M. J.*, 1910, **39:** 389.
4. BATES, *Canad. M. Ass. J.*, 1925, **15:** 1012.
5. MCLEAN, *Univ. Manitoba Med. J.*, 1934, **5:** 49.
6. DUNCAN GRAHAM, Personal communication.
7. BELT, *Canad. Pub. Health J.*, 1933, **24:** 586.

* Since these papers were submitted for publication four more cases of amœbic infestation have been admitted to the Royal Victoria Hospital.

couver, one in Regina, and one in Montreal, and three more probably received their infection in that city. The possibilities are obvious, but so far there has been no undue cause for worry. Of the fifty cases of amœbic infestation recently diagnosed in Canada nine were indigenous—one in Edmonton, one in Regina, and seven in Montreal. The remainder hailed from such widely separated points as Chicago, Porto Rico, Central Europe, Poland, Russia, Morocco, Salonika, Madagascar, Mauritius, India, parts of the Far East, and China.

All this should put us on our guard in Canada. Experience, not only in Montreal but elsewhere, leads us to conclude that amœbic infection can be readily overlooked, for in not a small proportion of cases there are no symptoms or, if present, they are trivial. The typical text-book cases, especially if there is a previous corroborative history, naturally will at once arouse suspicion; it is the mild or atypical case that causes the difficulty. We would say that any case of diarrhœa that does not yield promptly to simple measures calls for special care in examination. It may be a case of amœbic infection. Further, alternating attacks of constipation and diarrhœa, associated with anorexia, malaise, loss of weight, and abdominal discomfort should suggest two things—carcinoma somewhere in the intestinal tract and amœbic infection, all the more if the stools contain blood and mucus. X-ray examination with the barium meal and enema will probably clear up the diagnosis if carcinoma is present. It should be remembered, however, that carcinoma and amœbiasis of the bowel may be associated in the same patient, as in one of the cases at the Royal Victoria Hospital. Microscopical examination of the stools by an expert is imperative in all suspicious cases. As at least five species of amœba are known to occur in the human intestine, only one of which, *Entamœba histolytica*, is pathogenic, it is easy for the tyro in parasitology to be mislead. Further, it should be noted that if the examination of the fæces proves to be negative this should not be accepted as conclusive; the cysts have a way of disappearing for a time, and the examination should be repeated at intervals. This fact, also, should be remembered when an opinion has to be given as to whether the host has become free of infection. The incubation period in amœbiasis may be long, from nine to ninety-five days, so that cases may continue to appear where they have not been detected at the first or earlier examinations. The health department of Chicago reports that from ten per cent of the food-handlers examined during November of last year were found to be infected even after three previous examinations had been negative.

While the care of the individual patient is important and should call out all the resources of the practising physician and the laboratory it should be emphasized that amœbiasis has increased to such an extent as to be a public health problem. Amœbic dysentery should become a notifiable disease in the Provinces where this is not already the case. In the case of outbreaks carriers should be looked for. We know that the infective agent may be spread from the carrier or patient to the food. Therefore, the utmost cleanliness should be required of those who handle food. Particularly, all green vegetables imported from the southern United States should be carefully washed before using, if they are to be eaten raw. It is known, too, that when a case of amœbic dysentery occurs infection is very apt to be spread among the members of the patient's family. Hence the need of personal cleanliness and of disinfecting the stools. The attending physician has a responsibility here. The rôle of the fly as a carrier is also of some importance. The existence of amœbiasis in any community is a challenge to private physicians, hospitals and health authorities.

A.G.N.

THE ETHICS AND PSYCHOLOGY OF ADVERTISING

ADVERTISING is a matter of importance to all editors, whether they be editors of newspapers, magazines or medical journals. For ourselves we have to confess that the selection of advertising matter for admission to the *Journal* gives us more concern than almost any other phase of our work. We say "We exclude from our columns all known questionable advertisements and appreciate notification from our readers relative to any misrepresentation." Perhaps this statement could be better worded, but at least it shows that we are not unmindful of our responsibilities. For a considerable time a sub-committee of the Editorial Board has existed for the purpose of dealing with this matter.

The statement quoted above suggests at once the question as to what standards should be set up for judging advertisements. This is not so easy as it seems. On first thoughts one would be inclined to postulate that an advertisement should be "true" as to fact and statement. Thus, if So-and-So's ether is stated to be suitable for purposes of anæsthesia, and this statement is supported by an analyst's report indicating the degree of purity, such an advertisement would be admissible without question. On the other hand, if a certain remedy was vaunted as a sure "cure" for cancer or for a whole host of unrelated diseases, say, from dandruff to fallen arches, such advertising is obviously "untrue" and, so, reprehensible. Again, an advertisement may not be so obviously "untrue", but is actually untrue because of partial statement, gross exaggeration, or unwarranted suggestion or implication. Decision in the first two cases is easy. The difficulty arises in connection with a considerable number of drugs, animal derivatives, proprietary preparations, and appliances that fall into an intermediate position, the advertisements relating to which are possibly misleading because of exaggeration, misrepresentation, partial truth, or because they contain statements that it is difficult to verify or contradict. It may, indeed, be impossible to decide on the merits of some particular preparation without elaborate laboratory and clinical tests. Whether advertisements of this order should be accepted depends on the point of view, and opinions will differ. Doctors themselves sometimes disagree as to the merits of certain remedies which they are all using every day. Did not Hippocrates say "Experience is fallacious and judgment difficult?" The Editorial Board says that it excludes all advertisements known to be questionable, but, in the final analysis, it is clear that it must use its own judgment as to what is "questionable" and what not. This does not imply that the Editorial Board necessarily endorses the statements contained in any given advertisement, or that the practising physician is absolved from applying his own standards to the acceptance of the statements therein. We do our best. All of this relates, we should state, to the type of article that seeks its market among the medical profession and is advertised in medical journals. Some of these articles are advertised to the lay public as well but this introduces other considerations which we need not deal with now.

When we come to the advertising that meets us in the daily press, in the popular magazine, that comes over the radio, and "decorates" the billboards there can be no two opinions about much of it in the minds of thinking people. We agree with our contemporary, *The Journal of the American Medical Association*, when it says, "It is no secret that the development of modern advertising, particularly for certain types of drugs, foods, and cosmetics, has been so extravagantly elaborated and altogether so grossly exaggerated, misleading and unwarranted as to smell to high heaven in the nostrils of every honest man." Attempts are made to "put over" wares by lying statements, by misrepresentation, by gross exaggeration, by suggestion, implication and innuendo. Some of the preparations advertised are useless for the purposes for which they are vaunted; they are objectionable because they are deceptions. Others are harmful because they contain drugs that are powerful and should not be in common use. Some, in former times, at least, were popular because

of the amount of alcohol they contained. Some, presently or recently on the market, are positively dangerous to life. Not long ago a depilatory ointment which depended for its action on thallium was being pushed; some of those using it developed alarming symptoms. The margin between a safe (therapeutic) dose and a dangerous one is very small, and the administration of thallium internally has been known to cause death. The concern promoting the ointment referred to, being faced with a number of suits for damages, quietly decamped with the "swag," leaving the victims without recourse. In a certain application for the eyebrows there is an anilin dye, which, if it gets into the eyes, is competent to produce severe keratitis, with, possibly, blindness. Some hair dyes, also contain salts of lead. The frequent application of these may cause local irritation or systemic poisoning, the latter all the more serious because insidious. Further, advertisements do not mention, of course, that some persons may exhibit an idiosyncrasy towards a certain drug or chemical and to such it is dangerous. The public should be protected against all such harmful preparations.

Sometimes drugs and compounds which are useful within their limits and have acquired a following are extolled by improper methods. One such is sold over the counter by drug stores, is advertised over the radio as an effective and harmless remedy for "headache," despite the fact that it is not harmless if taken in excess and the further fact that "headaches" come from many causes, some grave, and should not be palliated until expert examination has shown them to be trivial. A certain mouth wash that has its sphere of usefulness and has been on the market for years has recently been advertised as being able to kill germs *instantaneously*. It must, indeed, be powerful! Only fire and some few caustics can do this. Boiling water cannot; other mouth washes cannot. It is regrettable that manufacturing firms which should know better are descending to this kind of thing. How far exaggeration may be carried in advertisements without becoming reprehensible is apparently a matter of opinion and, therefore, admits of argument, for the Criminal Code of Canada (Snow, 1928, Sec. 404) states that "exaggerated commendation or depreciation of the quality of a thing is not a false pretence, unless it is carried to such an extent as to amount to a fraudulent misrepresentation of fact."

Don Knowlton, himself an advertising man, in *The Atlantic Monthly* for April, 1933, (page 403) asks the awkward question—How much advertising is really "true?" He answers that "most advertising is based upon actual facts. But very little of it is really true." He, clearly, does not expect complete candour in an advertisement. Nor, indeed, do we, human nature being what it is. Truth in advertising is an ideal to be aimed at, certainly, but, if it prevailed, there would be much less advertising.

Mr. Knowlton asks the further illuminating question—"Who in the world wants truth in advertising?" This brings up an interesting point in psychology. Most people, if they do not like to be hoodwinked, are, at any rate, "easy marks." They believe what they want to believe. Take "beautifiers" and "physical culture", for instance. Every Mayme and Sade thinks she has the potentialities of a Venus or a Cleopatra; every John Doe and Richard Roe would be a Hercules or an Alexander. "Hope springs eternal in the human breast" sings the poet. But if there is a playing on hope there is also an appeal to fear. If you have "backache" or "headache" or "spots before the eyes" you are a marked man; you have Bright's Disease or Diabetes, or such atrocious malady, or will have unless you take Barnum's Balsam or Hokus's Elixir. A large proportion of the public is ignorant or, at best, semi-educated; many are uncritical and the element of superstition is not dead among us, no matter what our intellectual quality. Hence a lucrative field for exploitation is always available and old tricks find ever a new application. There is a psychology of advertising and the temptation to trade on the credulity of the human race is great.

What is the remedy? Clearly, to prohibit the sale of dangerous commodities, to prevent fraudulent statements, and, where necessary, to protect the public from itself. Here is the province of legislation. But more than this is required—better education of the public.

A.G.N.

SOME FOOD AND DRUG ACTS

THAT there is a tendency for abuses to creep into advertising will be readily admitted, due, of course, to the stress of competition and the desire, natural enough, to increase one's profits. When abuses become flagrant the law steps in to control the situation, It is quite evident, however, that this control has not been so effective hitherto as could be desired. There are many loopholes in existing Acts. They are realizing this in the United States and an effort is now being made to bring about an improvement. It is proposed to repeal the Food and Drug Act of 1906 and to enact an entirely new law. A Bill, commonly known as the Tugwell or Copeland Food, Drug and Cosmetic Bill (S. 1944, H.R. 6110), is being brought up at the next session of Congress which is a great advance over the Act presently in force. Among other things it establishes standards for all food products and it forbids the offering of medicines as "cures" for certain diseases. The existing Act of 1906 forbids misrepresentation on the labels of the various products, but manufacturers may make any claims they wish in printed advertisements, through the mails, on bill-boards, or over the radio. The new Act, if adopted, will prevent all this, with stiff penalties for violations. A heavy blow is aimed at unscrupulous vendors in a clause that automatically classifies as false "any advertisement of a drug representing it directly or by ambiguity or by inference to have any effect in the treatment" of a lengthy list of maladies, including our old friends "blood poison", "sex weakness", diabetes, dropsy, paralysis, cancer, tumours, and tuberculosis. Further, if a preparation is merely a palliative, or if it contains any habit-forming drug a warning to that effect must appear on the label. A notable innovation is the inclusion of cosmetics with foods and drugs. As defined in the Bill, the term "cosmetics" includes many things besides "beautifiers" such as powder, lipstick and eyebrow pencil. The definition is most comprehensive. It covers "all substances and preparations intended for cleansing or altering the appearance of, or promoting the attractiveness of, the person." Thus, soap, tooth paste, shaving cream, face lotion, and many other things are to be "cosmetics." Depilatories that make you bald, eyelash dyes that make you blind, and hair restorers that give you lead poisoning will be prohibited if the plans go into effect. In as much as the Bill is understood to be a departmental measure it is probable that it will pass, at least in its main features. The more reputable of the manufacturers of the commodities dealt with in the Bill are said to be in general agreement with it; the chief opposition is coming from certain elements of the proprietary medicine trade, as one would expect. The principal struggle, we understand, will be over the question of misrepresentation. It may be added that the Bill does not do away with the divine right of the great American public to doctor itself, but it ensures that at least it will know what medicaments it is putting into its stomach!

This is not without interest to us in Canada. Objectionable advertising is not unknown here and certain types of it are not adequately controlled. Our Food and Drugs Act (R.S. 1927) and An Act Respecting Proprietary or Patent Medicines (1908, R.S. 1927) are excellent up to a point, and include safeguards that only now are being provided in the Tugwell Bill, but they are defective as compared with that Bill for one thing, namely, that cosmetics and toilet articles are not included in their scope. If the Tugwell Bill becomes law we may find that there is an increase in the amount of objectionable advertising relating to such in our journals. In the Canadian Food and Drugs Act standards of quality and the limits of variabilities permissible in any food or drug are prescribed, and in the Proprietary or Patent Medicine Act the safeguards established are wide-reaching. For example, in Chapter 151, Section 8, (Revised Statutes of Canada) the latter Act states, among other things, that no proprietary or patent medicine shall be manufactured, imported, exposed or offered for sale or sold in Canada, (*e*) if the article be represented as a "cure" for any disease, and (*f*) if any false, misleading or exaggerated claims be made on the wrapper or label or in any advertisement of the article. One might enquire whether

the word "advertisement" used here is broad enough to cover advertising by radio. What is "false", "misleading," or "exaggerated" is, of course, a matter of opinion, and the way is open for argument at law.

A schedule of fifty-eight drugs is included, and any proprietary or patent medicine which contains any one of these must show conspicuously printed on an inseparable part of the label and wrapper of the bottle, box, or other container the name of the drug and the amount per dose, otherwise it may not be sold (sub-sec. C). Also, if the quantity of such drug exceeds the amount permitted by the Advisory Board the preparation may not be sold. We notice that certain more or less dangerous drugs are not included in the schedule,—thallium and salts of lead, for example. The reason is, of course, that as these substances are chiefly used in toilet articles the Act does not cover them. To quote, "This Act does not apply to medicinal preparations which bear on the labels and wrappers the true formula or full list of medicinal ingredients, or to medicines designed for veterinary purposes solely, or to *articles intended only for toilet use* (the italics are ours, Ed.). See Sections 2 (d); 4(I); 6 (I). Barbitone (veronal) is on the list, but other derivatives of barbituric acid and those of salicylic acid are not mentioned.

Section 8 (2) states also that "No proprietary or patent medicine intended for administration to infants under one year of age shall contain any derivative of coal-tar, which in the opinion of the Advisory Board is dangerous to children under one year of age (1919, C. 66, S.1.).

One may doubt whether the powers conferred on the Advisory Board are sufficiently wide, being confined (Sec. 9 C 2) to the prescription of "what shall be deemed a sufficient medication of medicines containing alcohol in excess of two and one-half per cent to make them unfit for use as beverages", a very wise regulation, and to ordain "what shall be the maximum single and daily doses to be prescribed in the case of any medicines consisting of or containing any drug mentioned in or added to the Schedule to this Act." One is not sure what the jurisdiction of the Advisory Board would be in the case of preparations that are harmless but useless for the purposes advertised, and in which cheap materials are sold at an exhorbitant price. Possibly this case would come under Sec. 8 (*f*) which relates to false, misleading or exaggerated claims. A.G.N.

Editorial Comments

Dinitrophenol

The danger of powerful drugs, such as the well known poisons, is so well recognized that warnings do not have to be continually given regarding their use. With the development of modern chemical compounds, however, powerful substances are being produced which do call for these precautionary measures. We publish in this issue a brief account of one of the latest of these to appear in the field of chemical medicines, namely, dinitrophenol. As Dr. Rabinowitch points out, it has been brought into prominence as a result of the search for a substance which will accelerate metabolism. Desiccated thyroid has so far been our most reliable agent for this, and chemical research has now brought the preparation of this to a high state of efficiency. Thyroxine, its active principle, has also been isolated, but for reasons which are still obscure it is not as reliable as the desiccated gland when given orally. Other chemical compounds have also been synthesized, such as 3.5 diiodo-thyroxine, which is effective in accelerating metabolism and relieving symptoms of myxœdema, but to a less extent than thyroxine.

Now dinitrophenol comes into the field, one of the group of nitrophenols, whose effect on metabolism has for some years been recognized, but so far has been regarded largely as a laboratory curiosity. Recent investigations, however, have led to its use both experimentally and clinically, not only for such diseases as myxœdema but for the reduction of obesity. Its outstanding feature is its potency in minute quantities. Indeed it still retains something of the qualities with which its use was first associated, for it is capable of accelerating metabolism with an almost explosive violence, and as a result is highly toxic. Dr. Rabinowitch's work in the Montreal General Hospital under carefully controlled conditions shows this very clearly. His object is not only to describe the well known metabolic powers of the drug but to sound a timely note of caution in its use, since dinitrophenol holds out the hope of being a most effective agent in reducing obesity. We would draw the attention of our readers to a work which is both fresh and well balanced. H.E.M.

Dr. Frank Burr Mallory's Seventieth Birthday

The Council of the American Association of Pathologists and Bacteriologists has devoted a special supplemental number of its journal, the *American Journal of Pathology,* to the occasion of Dr. Frank Burr Mallory's seventieth birthday, and the opening of the Mallory Institute of Pathology of the Boston City Hospital.

Dr. Mallory's association with the hospital dates from 1891, when he was appointed an assistant to the pathologist, until his official retirement last year at the age of 70. Even in the matter of time this is noteworthy, but Dr. Mallory has given far more than length of service. His contributions to pathology have covered a wide field and the quality of his work bears the stamp of a keen, a critical and untiring mind, but as Dr. Leary says in his biographical note on him, "More remarkable than the production of publications has been the production of men . . . Through this laboratory during the years has passed a notable group of young men, destined to attain distinction in the teaching of medicine. Each neophyte was required to progress through a series of assigned duties, from the sharpening of knives, the practice of histological technique, bacteriological diagnosis, daily conferences on surgical diagnosis, autopsy technique . . . to methods of teaching and of research. Moreover his training was overseen personally by Dr. Mallory, with whom in frequent conferences his critical sense was ripened, he was taught the need of scientific curiosity and horror of slipshod methods." The list of those who have been so fortunate as to pass through his training ground is a long and remarkable one. From it have been chosen those whose papers go to make up this memorial volume. We are glad to note the inclusion amongst these last names of two men associated with McGill, Dr. S. B. Wolbach, former pathologist, and Dr. L. J. Rhea, the present pathologist of the Montreal General Hospital. H.E.M.

Special Articles

GENETICAL ASPECTS OF STERILIZATION OF THE MENTALLY UNFIT

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Several articles have appeared in these pages within the last few months upon a question of which the medical profession is forced to take cognizance, not only because it is a matter which involves their technical skill but also because it lies in the field of preventive medicine. This is the question of sterilization of the mentally unfit. It has been stated by those who either disapprove of sterilization, or who are not convinced that it is a solution of the problem, that were we to sterilize all the mentally unfit to-day, we would within the next twenty-five or fifty years have just as many mental defectives as we have now. Others state that the percentage of feeble-minded would be so little reduced as to make the difference negligible. Both these statements are made on the strength of the fact that many of the mental defects are due to inherited *recessive* factors. This recessiveness of the genetic factors enables normal persons who are carriers of the defect to breed defective children. Thus this group of carriers, it is said, would keep up the supply of defectives, despite the sterilization of the mentally unfit themselves.

Because these arguments are based upon an erroneous conception and upon false genetical concepts, I wish to present several pertinent facts. They are not presented as propaganda either for or against sterilization; they are merely incontrovertible scientific data which deal with the genetic aspects of this question, and which should be understood. First of all, we will assume, with those who have been arguing as stated above, that most cases of mental deficiency are due to heredity, and that the type of transmission is evidence that the conditions are due to recessive factors, either unit or multiple. The figures here would vary of course, depending upon the number of recessive factors responsible for the mental defect, and upon the ratio of normal persons to carriers and to defectives in the population. For simplicity of

TABLE I

1.		NN	x	NN	=	4 NN				
2.	2	NN	x	NF	=	4 NN	+	4 NF		
3.	2	NN	x	FF	=			8 NF		
4.	2	NF	x	FF	=			4 NF	+	4 FF
5.		NF	x	NF	=	NN	+	2 NF	+	FF
6.		FF	x	FF	=					4 FF
						9 NN	+	18 NF	+	9 FF
						25%		50%		25%

exposition, the simplest possible combinations will be chosen to illustrate the principles. We will assume that the mental defects are due to unit-recessive factors, and that the numbers of normal persons, carriers, and defectives are all the same in the population. It is impossible to adopt the correct ratios, for we do not know even the actual number of defectives in the

population; far less do we have any adequate conception of the number of carriers.

Making the assumptions just noted above, let us turn to Table I. We will designate the normal persons as *NN*, having received a factor for normal mentality from both parents. The carriers will be called *NF*, having received a factor for normal mentality from one parent, and a factor for feeble-mindedness from the other; they are nevertheless normal. The actual feeble-minded we will call *FF*, inasmuch as they have received factors for deficient mentality from both parents. Let us further assume that there is non-assortive mating, and that all three types of persons are equally fecund. If we make these assumptions, we get the matings seen in Table I. Each type is apt to mate with each of the three types equally freely, with the result that we have two matings of each type with the other two types to one mating of each type with itself. Normal mated with normal, with carriers, or with feeble-minded produce only normals, (Matings 1, 2 and 3), although some of these normals are carriers of the defect. Matings of carriers with defectives would give equal proportions of carriers and defectives, (Mating 4); mating of two carriers would give normals, carriers and defectives in the proportion of 1:2:1 (Mating 5), and finally defectives with defectives would give all offspring defective (Mating 6). Since we have stated that all the matings were equally fecund, we shall have to assume four children to a family, that being the necessary number to bring out all the possibilities in Mating 5. As a result of this non-selective breeding and equal fecundity we have a population in which the ratio of normal to carrier to defective has changed from a 1:1:1 ratio in the parents in Table I to a 1:2:1 ratio in the offspring.

TABLE II

1.	NN	x	NN	=	4 NN				
2.	4 NN	x	NF	=	8 NN	+	8 NF		
3.	2 NN	x	FF	=			8 NF		
4.	4 NF	x	NF	=	4 NN	+	8 NF	+	4 FF
5.	4 NF	x	FF	=			8 NF	+	8 FF
6.	FF	x	FF	=					4 FF
					16 NN		32 NF	+	16 FF
					25%		50%		25%

Now let us consider this generation of offspring growing up, freely mating, and being equally productive in all matings. We see the results in Table II. In order to determine the proportionate number of the different kinds of matings it is only necessary to apply the binomial theorem. If a is a normal person, b a carrier, and c a defective then we have in our population $a + 2b + c$. Squaring this yields $a^2 + 4ab + 4b^2 + 2ac + 4bc + c^2$. Applying this to the matings of Table II, and again assuming four children to a family, we find that again we have the offspring appearing in a ratio of 1:2:1. No matter how many generations this is continued, we shall always have normals, carriers and defectives appearing in the ratio of 1:2:1 if we start out with those three types as we had them in Table I.

Suppose now that we eliminate the *FF* persons as they appear, that is, eliminate them from the reproductive scheme by sterilization. Thus we allow only the normals and the carriers to breed. We note that the offspring in Tables I and II are in the proportion of 1:2. Therefore carriers are more apt to mate with normals and with themselves than are normals to mate with normals. If we expand the expression $(a + 2b)^2$ we get $a^2 + 4ab + 4b^2$. Thus, with non-selective mating there will be *four* matings of carriers with carriers and *four* matings of carriers with normals for every *one* mating of normals with normals. Again, assuming 4 children to each mating we get the results seen in Table III. We find that from a parent genera-

TABLE III

1.	NN	x	NN	=	4 NN				
2.	4 NN	x	NF	=	8 NN	+	4 NF		
3.	4 NN	x	NF	=	4 NN	+	8 NF	+	4 FF
					16 NN	+	16 NF	+	4 FF
					44.5%		44.5%		11%

tion in which there were twice as many carriers as normals we have offspring in which the numbers of carriers and normals are equal. In the offspring half of Table II the normals constituted only 25 per cent of the population; in the offspring side of Table III, after the *FF* persons were eliminated from the scheme, the normals constitute 44.5 per cent of the population. They have almost doubled their proportion. Moreover, the carriers who constitute the class which is supposed to keep up the supply of defectives, even under a sterilization plan, has been reduced from 50 to 44.5 per cent. Most important of all, perhaps, is the fact that the *FF* group which just one generation before constituted 25 per cent of the population now forms but 11 per cent. It is true that sterilization of that one generation did not succeed in eliminating all the defectives in the next generation, but it reduced their percentage by more than 50.

One of the most significant things, however, does not come out until we watch this generation on the right-hand side of Table III begin to reproduce. In the left side of Table III, out of every five matings in which a normal person was involved, there was only one in which two wholly normal mates came together. But because of the altered ratio of normal to carrier, normals have a better chance of mating with each other, and so in Table IV, due to the 1:1 ratio on the right-hand side of Table III, normal mates with normal in *one* of every *three* matings in which a normal person is involved.

TABLE IV

1.	NN x NN	=	4 NN					
2.	2 NN x NF	=	4 NN	+	4 NF			
3.	NF x NF	=	NN	+	2 NF	+	FF	
			9 NN	+	6 NF	+	FF	
			56¼%		37½%		6¼%	

Table IV shows the results of free mating after the second generation of *FF* persons found in the right half of Table III is eliminated. Now, the offspring who are normal constitute 56.25 per cent; the carriers 37.5 per cent, and the defectives only 6.25 per cent. Thus two generations of sterilization have reduced the *FF* group by 75 per cent; from being 25 per cent of the population they are only 6.25 per cent. The ratio of normal to defective, which was 1:1 two generations ago, now is 9:1. The ratio of normal to carrier, which was 1:2 two generations ago, is now 3:2. There can be no doubt that elimination of *any* type from the population, be it good or bad, not only alters the proportion of that type in subsequent generations but it also materially alters the constitution of the rest of the population so that ratios of other groups to each other are altered.

TABLE V

1.	9 NN x NN	=	36 NN					
2.	12 NN x NF	=	24 NN	+	24 NF			
3.	4 NF x NF	=	4 NN	+	8 NF	+	4 FF	
			64 NN	+	32 NF	+	4 FF	
			64%		32%		4%	

Let us carry this one generation farther. In Table V, we have made the matings in their proper ratios after having eliminated the few defectives which came out in Table IV. The result is that the normals and carriers have just reversed their proportions from what they were three generations ago in Table II. Carriers were twice as numerous as normals then. Three generations of removing the defectives has not only lowered the percentage of defectives but it has made normals twice as numerous as carriers. Defectives have still further fallen from 6.25 to 4 per cent. Normals are more than two and a half times as frequent as they were, and carriers have dropped more than a third. It is needless to go on farther. We have definitely shown that removal of the defectives from the reproductive scheme does materially lower their percentage and that the carriers do not keep up the supply.

Someone might, at this point, mention that the rate of fall of the defective population decreases with each generation. The first decrease was 56 per cent; the next 43; and the third was only 36. He might say that at this rate we should never get rid of all the defectives; it would require thousands of years to rid the world of the last defective. It is only necessary to mention that when we get down to the last defective, death will accomplish for us what thousands of years could not do. We need not worry about the one defective who may be left if we can get clear of the burden of the other ninety-nine.

But we have made several assumptions in the above discussion that are not justified on the basis of facts. These assumptions are in favour of those who disapprove of sterilization, however. We have assumed to begin with that there was non-assortive mating, that normals and carriers mated as freely with defectives as with their own class. We have further assumed that all matings are equally fecund. Both assumptions are erroneous. A normal person does not pick a feeble-minded mate; the normal strain does not often intermix with the abnormal except in occasional illegitimate unions. Nor is it necessary to remind the reader that the more intellectual classes are not breeding as fast as the less-endowed classes. The higher in the intellectual scale a person is the smaller his family, on the average. The reasons for this we will not discuss here; they are sociological not genetical. But a recent investigation by Dr. W. L. Hutton, of Brantford, reported before the Ontario Educational Society in Toronto last spring (see this *Journal*, 1934, **30**: 73), showed that the average number of children to a family in Ontario was 3, while the average number of children to the families who had inmates in the home for feeble-minded at Orillia was 9. Thus the less intellectual class is breeding three times as fast as the normal classes.

Let us apply these facts to Table I, and see what difference they make. We will allow *FF* persons to mate among themselves, not with the other groups who have normal mentality. We will let the defective groups have twice as many children instead of three times as many, so as not to be accused of exaggeration. The results are shown in Table VI. Here because of selective matings, and because of higher fecundity in the defective classes, we see that one generation alone of such matings alters the ratio from 1:1:1 with which we started on the left-hand side of Table VI to a 28:19:53 ratio in the offspring. The defectives are almost twice as numerous as the normals, and more than equal the normal and carrier classes together.

TABLE VI

1.	NN x NN	=	4 NN					
2.	2 NN x NF	=	4 NN	+	4 NF			
3.	NF x NF	=	NN	+	2 NF	+	FF	
4.	2 FF x FF	=					16 FF	
			9 NN	+	6 NF	+	17 FF	
			28%		19%		53%	

Carry this policy one generation on. In order to express all the types of matings in their true proportions we must multiply the 9 *NN* persons in Table VI by three and a third; hence we must do the same with the 6 *NF* and the 17 *FF* groups. The results are seen in Table VII. We now have

a population in which the normals are 20 per cent; the carriers are 10, and the defectives are 70 per cent. The ratio of normal to defective

TABLE VII

1. 9 NN x NN	= 36 NN		
2. 12 NN x NF	= 24 NN	+ 24 NF	
3. 4 NF x NF	= 4 NN	+ 8 NF	+ 4 FF
4. 28 FF x FF	=		224 FF
	64 NN	+ 32 NF	+ 228 FF
	20%	10%	70%

has altered in two generations of unrestricted breeding among defectives from a 1:1 ratio in Table 2 to a 2:7 ratio in Table VII in favour of the defectives.

A policy of non-elimination has therefore *increased* the percentage of feeble-minded and has *lowered* the percentage of normals; while a policy of elimination has steadily reduced the undesirable group, as well as it has modified the constitution of the remainder of the population so that the carriers form progressively lower percentages.

So far this has been theory, in that we have been dealing with theoretical not actual populations. What are the real figures for the population of the Province of Ontario, for example, for which records have been kept for the last 60 years? Has the percentage of mental cases increased out of proportion to the rest of the population? If it has, then we have good evidence that such increase has been due, in part at least, to the policy of not eliminating the defective stock, for our theoretical consideration has shown us that such an increase would take place under such circumstances.

The figures to be presented here were obtained from the Canada Year Books and the Ontario Sessional Papers, also from the census records. It is true that they were not in the form in which they are presented here, but the calculations are easily made from the original data.

In the 60 year period from 1871 to 1931 the population of Ontario was just about doubled. During that same time, the population inside our mental institutions had increased six and a half-fold. This may have been due, however, to factors other than the excessive increase of mental cases. It may have been caused by the fact that whereas in 1871 only a few of the worst cases were put into institutions, in 1931 there was far more adequate provision for this class. It may also have been due to the fact that our diagnosis of mental cases is much better to-day than was formerly the case, with the result that more patients were institutionalized in 1931 than in 1871.

Let us examine the first of these statements in the light of facts. In 1871, just about half of the number of mental cases recorded in the census of that year as existing in the province were inside the institutions. In 1927, the Ross Commission stated that there were on the waiting list at Orillia as many children as were already inside the institution. Children's Aid societies have recently been credited with the statements that only the flagrant cases get on to the waiting lists; the milder cases are kept at home because of lack of room. It seems, therefore, that we are not putting a larger percentage of our mental defectives into institutions to-day than were housed within them in 1871. Moreover, if we take into account the total number of mentally defective persons in 1871, which included both those within and those without the institutions, we find that in 1931 the institutional cases alone were more than four times as many as the total group for 1871.

Let us examine the other statement, that our better diagnosis of to-day may be responsible for the great apparent increase of mental cases. There is no doubt that to-day there are many children being listed as mentally defective who are borderline cases and who would have escaped that label in 1871. On the other hand, due to the fact that our institutions have by no means kept pace with the great number of mental cases, such borderline cases are not being institutionalized to an extent appreciably greater to-day than they were formerly. There is no room for

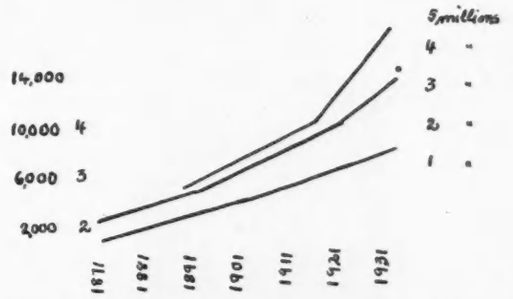

FIG. 1.—Shows the relative growth of the general population (bottom line), the population in our mental institutions (middle line), and the cost of maintaining these patients (upper line) from 1871 to 1931 for the Province of Ontario. The figures to the right indicate the scale on which is plotted the cost, or the top line. The figures on the extreme left indicate the scale on which the second line or inmates of mental hospitals is plotted; the figures 2, 3, 4 indicate the population in millions, on which the bottom line is plotted.

them. Therefore, when we say that with a two-fold increase in population there has been a six and a half-fold increase in mental cases we are in all probability making a rather conservative statement.

One other item might be mentioned in passing. Although the mentally defective or mentally ill population has increased six and a half times, the cost of caring for them has increased well over ten times. This proportionate growth of population, mental cases, and cost for the latter is well illustrated in Fig. 1. Were the total number of mental cases known for the last decades, the middle line would have been much higher throughout its extent. As it is, it repre-

sents only the institutional cases, not the total number in the province.

An extremely important point has been brought out by this study of the growth of the mentally ill population in Ontario. It is one we could have foretold through a study of the theoretical populations discussed in the seven Tables of this paper, and an enunciation of it here will make clear the discussion of the figures which are to follow. *Not only has the mentally defective population been increasing every decade from 1871 to 1931, but the rate of increase has been accelerating.* Let us examine the

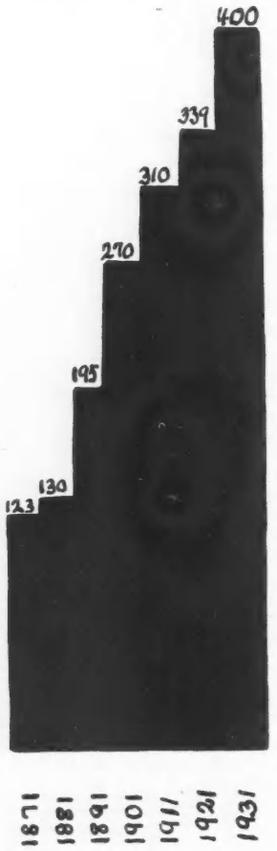

FIG. 2.—In this the number of cases within the mental institutions per 100,000 of the general population is shown for each decade from 1871 to 1931. Had the growth of mental cases been in proportion to the growth of the population, the top of the figure would have been a straight line extending from left to right, at the height of the 1871 column.

figures from 1871 to 1911 for which we have the total number of mental cases in the province, both inside and outside our institutions. In 1871, there were 247 mental cases per 100,000 of the population. In the next twenty years, this had risen to 276 per 100,000, an increase of almost 12 per cent for the twenty-year period, or an increase of 6 per cent for each decade. From 1891 to 1911, the figure had risen from 276 to 350 per 100,000, an increase of 26 per cent for the twenty-year period, or approximately 13 per cent for each decade. At this point we must shift from the total number of mental cases to the number of institutional mental cases, the former figure not being available for 1921 and 1931. But for those inside the institutions there was an increase in this one decade of 18 per cent in the number of mental cases per 100,000 of the population. At the beginning of the 60 year period, the increase in the number of total mental cases over and above the increase of the population was 6 per cent; in the middle of that period it was 13 per cent; at the end of that period it was 18 per cent. Thus there appears to be an acceleration in the rate of increase of about 6 per cent for each decade. Not only are the mental cases increasing faster than the general population, but the rate of increase is accelerating each decade.

In Fig. 2, are shown the increases, not in the total number of mental cases, but in the institutional cases within the province within the last 60 years. Of course, had our institutions remained stationary, the number of cases accommodated must also have remained stationary. Although the institutions have increased in capacity, they have not kept pace with the increase of cases, as shown by the comparison of the figures in the foregoing paragraph, where the total number of cases is dealt with, and the numbers in this in which only cases inside the institutions are listed. Although this figure shows an increase of institutional cases per 100,000 of the population every year, *it does not show the acceleration in rate of increase which the total number of cases reveals.*

Beginning with the year 1882, the number of cases inside the institutions was listed, and from that has been computed the relative number who would have been institutionalized in 1871. This figure is probably a little high. It shows, however, that about half the cases in 1871 were in institutions, half outside. In 1871 there were in our institutions approximately 123 mental cases per 100,000 of the general population. In 1881, this number had risen to 130 per 100,000. In 1891, it stood at 195; in 1901, at 270; in 1911, at 310; in 1921 at 339 and in 1931 at 400 per 100,000 of the population. Had the proportion of mental cases to the general population remained stationary throughout that 60 year period, the top of Fig. 2 should have been a straight line, instead of the series of ascending steps shown there.

If we allow for the increase in population, the increase in the mental cases becomes even more striking. Thus in 1931 there were 116 persons in the general population for every 100 who had been present in 1921. But in the mentally defective population there were 132 persons in 1931 for every 100 in 1921.

We have seen that the history of the past 60 years in the Province of Ontario is exactly what a geneticist would have predicted upon the basis of the seven Tables presented in this paper. Since theory has agreed so well with fact, let us

project ourselves into the next 25 years, on the basis of what has happened in the past 60. If the mental cases in Ontario continue to increase each decade by 32 per cent over what they were the decade before, (and there is every reason to think that they will increase even faster than this, the rate having accelerated every decade for the past 60 years), and if we continue to provide for the mental cases in about the same proportion that we are caring for them now, then by 1956, the number of cases within our institutions will be exactly double what they were in 1931. That means that each of the provincial institutions now in existence must be duplicated in size and in staff within the next quarter century, a period most of us expect to live through. But the population of the province will by no means have doubled within that time. Indeed it is not due to double itself until the lapse of the entire century, perhaps not even then with the steadily falling birth rate. Thus, although there will be approximately 130 persons in 1956 for every 100 in 1931, there will be 200 mental cases in 1956 for every 100 in 1931, and the cost will have at least doubled, perhaps have multiplied by more than two, for new services are being constantly demanded for this group of mental cases. This prediction is not an extravagant one; it is based upon the solid foundation of fact.

In conclusion, I would say that, although I am strongly in favour of sterilization of the mentally unfit, the above figures and the above genetical analysis of the situation are not the ideas of a protagonist; they are incontrovertible scientific facts. They must be acepted as such, no matter what one's personal opinion upon the merits of sterilization may be. The percentages worked out in the Tables, of course, are not to be taken as the percentages of normals, carriers and defectives found in the population of Ontario or elsewhere. The *principle* which these Tables enunciate, however, is absolutely unshakable, namely, that elimination of any stock from the general population, be it good or bad, does lower the percentage of that stock in future generations; moreover it alters the constitution of the remainder of the population so that the percentage of carriers in the population is lessened, if the defect be a recessive one. This is a genetical law which applies to any inherited character whatever. The actual percentage of reduction depends upon the factors in question, whether they are dominant or recessive, and upon the ratios of one type to another in the original population. Of course, the arguments here given only apply if the defects are inherited. If they are environmental in character, they are not subject to genetical laws. That however, does not affect the argument for sterilization. If bad environment be responsible for the defects, then dooming a normal child to be raised in the house with defective parents is the surest guarantee of producing similar defects in the offspring through adverse environmental conditions.

Whatever may be one's personal reaction toward this subject, the fact remains that with a policy of non-elimination of the defective stock, with selective mating, where defective mates with defective, and with a differential fecundity operating in which the defective stock breeds more rapidly than the normal, there is only one outcome—annihilation of the normal stock.

MUSIC AND HEALTH

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The first observations of the influence of music on the human body were made very early in recorded history, and perhaps the very first written observation is that occurring in the oldest of all Egyptian medical papyri, discovered at Kahum by Petrie, in 1889, and dating back to 2500 B.C. This contains an incantation in music which purported to influence the fertility of women favourably. Somewhat later Homer recorded the fact that it was music alone of all other therapeutic agencies which stopped the hæmorrhage in Ulysses. In Biblical times the case of Saul whose sorely tried spirit was calmed by the playing of David is well known. "When the evil spirit from God was upon Saul, then David took a harp and played with his hands. So Saul was refreshed and well, and the evil spirit departed from him."

This remarkable power of music in soothing the troubled mind and elevating the spiritual qualities of man was remarked by Polybius, who, speaking of a musical race of Arcadia, contrasted the gentleness of their manners with the cruelty of the Cynetes, who neglected the cultivation of music. Similarly, Greek historians tell us that Clytemnestra was stayed from a vicious inclination to unchastity by the sound of music, Terpender restored a rebellious people to their allegiance through his melodies, and Tyrtaeus, the Spartan, by certain verses which he sang to the accompaniment of flutes so inflamed the courage of his countrymen that they achieved a great victory over the Messenians, to whom they had submitted in several previous conflicts. Plutarch, in his life of Solon, related that the celebrated legislator excited the Athenians to invade and recover the Isle of Salamis, by singing an elegy of his own composition. Empedocles is said to have prevented the murder of his father by the music of his lyre, and the fierceness of Achilles was allayed by playing the harp, on which account Homer gave him nothing out of the spoil of Eetlion. Damon, with the same instrument, quieted wild youths, mad with drink; and Asclepiades in a similar manner brought back seditious multitudes to

temper and reason. Zenocrates, Sarpander and Arion, among others, employed music to curb the maniacal outbursts of madmen. Celsus pointed out different methods of influencing the minds of the insane, depending on the nature of their mania. "We must quiet their demoniacal laughter by reprimands and threats, and soothe their sadness by harmony, the sound of cymbals and other instruments." Using music in quite a different manner, Antigenides, the tibicinist, played before Alexander the Great and so inflamed him, that, leaping from his seat and drawing his sword, he, in a frenzy of courage, assailed those who were about him. Aristoxenes, thinking of music in a more benevolent mood, advocated its introduction at meals, inasmuch as, he said, its sublime symmetry restrained mental and physical excess.

Music in its more curative aspects was employed from very early times. It is certain, for instance, that the Thebans used the flute for the cure of many distempers, which Galen called: "*Super loco affecto tibia cavere.*" Martinus assures us that he was successful in removing fevers by song, and that Æsculapius cured deafness by the sound of the trumpet. Aulus Gellius is authority for the statement that a case of sciatica was cured by gentle modulations, and the Phrygian pipe was generally recommended by several of the ancient philosophers as an antidote to sciatica. Theophrastus, in his essay on "Enthusiasm," maintained that the bites of serpents and other venomous reptiles were relieved by music, and again Plutarch is authority for the statement that Thelates, the Cretan, delivered the Lacedaemonians from pestilence by the sweetness of his lyre. Similarly, Democrates asserted that the sound of the flute was a remedy against the plague. The status of music in ancient times as a beneficial influence was rather firmly established.

As time went on, the remarkable powers of music received even greater and more careful attention. Its widespread influence on mind and body was noticed and appreciated by even the most casual observers. Thus Napoleon, after his defeat in Russia, is alleged to have declared it was caused by the Russian winter and the Russian army music; the weird barbaric tunes of "those monstrous Cossack regiments" inciting the Muscovites to those furious attacks in which they wiped out the best regiments of the French army. How many similar incidents there are in which music played a deciding factor in victory have never been recorded, but these may have been many. In quite a similar manner to that by which Alexander the Great was incited to courage, it is related that Claude le Jeune, the favourite musician of Henry III, once caused a spirited air to be sung at a wedding," which so animated a gentleman who was present that he clapped his hands on his sword and swore that it was impossible for him to refrain from fighting with the first person he met; upon which Claude caused another air to be performed, of a soothing kind, which immediately restored him to his natural temperament.

Some people are influenced to a greater extent by music than others. An interesting case of this sort is recorded by Dr. Chomet. A young musician was so swayed by the passionate strains of the music in the opera "La Vestale," by Spontini, that he went again to hear the opera. He was so completely fascinated for the second time that he thought he had reached the maximum of happiness reserved for man on earth, and, not caring to live any longer, blew out his brains on leaving the opera house. Dr. Eastcott is authority for the story of a certain gentleman, residing in Devonshire in the early part of the last century, who was so affected on hearing a trio of Lampugnani's that he fell into a fainting fit, which entirely deprived him of speech and memory for more than an hour. Music had generally this effect on him, but he was so fond of it that he could not resist the temptation of hearing it, despite the strange effect it had on him. Some time after this he was in London, when he went to hear Dr. Arne's opera "Artaxeres." He stood over the orchestra during the overture with some difficulty, but the first song overcame him and he fell senseless over the back of his seat. A very interesting case, in which an individual, knowing of the strange power of music over his fellow-beings, and who used it toward a practical end, was that of Fillipe Palma, the singer, who had the unfortunate faculty of forever falling into debt. For this reason the house was continually beseiged by creditors. One day an enraged creditor burst into Palma's house, and the singer was not long in realizing that no soft words of his would allay the man's anger. He thereupon hit upon the idea of utilizing the more certain power of music. Accordingly, he sat down at the harpsichord and began to play so soothing a melody that the enraged creditor was slowly pacified; it is said, moreover, that he also provided him with money to pay off his other creditors.

A story in the same vein as the foregoing is told of the Sultan Amurath, who having laid siege to Bagdad and taken it, gave orders for putting to death some thirty thousand Persians, nothwithstanding the fact that they had submitted and laid down their arms. Among the number of these unfortunate victims was a musician. He besought the officer who had the command to see the sultan's order executed to spare him but for a moment, while he might be permitted to speak to the emperor. The officer granted him this favour, and being brought before the sultan he was permitted to exhibit a specimen of his art. The pathetic tones and exulting sounds which he drew from his instrument is said to have brought the sultan around to his better nature, and as a result of this he gave up his intention for a wholesale massacre of the Persians.

Therapeutic applications of music were made, as stated before, in quite a few abnormal conditions. In more modern times this was even more often taken advantage of. Some two hundred years ago Bruckmann and Hufeland re-

ported cases of St. Vitus' dance cured by music. Desessarts also recorded that catalepsy was cured in a like manner. Schneider and Becker ascertained its influence in hysterical and hypochondriacal affections. Bureete was of the opinion that sciatica could be relieved and even cured by music. So widespread was the enthusiasm for music therapy during the 17th century that a pretentious work appeared, entitled "Magis Universalis Naturæ et Artis," which contained bars of music that were reputed to cure persons bitten by a tarantula. As a matter of fact, the effectiveness of music in curing tarantula bites was further affirmed by Mead in England, Burette in France and Baglivi in Italy. Their explanation of this phenomenon, which is quite reasonable, is that music throws the patient into a violent fit of dancing, which, by bringing on profuse perspiration, effects the cure.

Among the oldest records of the Academy of Science at Paris the case is mentioned of an illustrious musician and composer who was attacked by continuous delirium. On the third day of his delirious fever he asked if he might hear a little concert in his own room. Bernier's "Cantata" was sung. As soon as he heard the first notes, his countenance became calm, his eyes assumed a quiet expression and the convulsions ceased altogether. As soon as the music stopped he relapsed into his former condition. After ten trials of the same treatment a complete cure was effected. The almost similar case of Philip V of Spain is even more famous. He suffered severely from melancholia, which nearly ended in madness. Court physicians' skill being exerted in vain, Farinelli, the famous castrato soprano, and a former favourite of the unhappy monarch, was sent for as a last resort. Being placed in an adjoining room to that in which the unhappy Philip sat brooding in melancholic solitude, he sang several joyous melodies. No result was perceptible on the first day, but the experiment being repeated, new songs being sung, and the hours of the audience extended, the king showed symptoms of reviving attention. He listened and gradually became absorbed in the exquisite solo concerts. His interest grew daily; he became discriminating, and, his attention being thoroughly aroused, his cure became rapid and permanent. George III, of England, also, was subjected to terrible fits of melancholia, and the only solace he received was from music. The king was well aware of the soothing effect on his nerves and mind, and would often ask for music when he felt one of his fits of melancholia coming on.

It was toward the end of the 18th century that serious efforts to evaluate the effects of music on the human body were initiated. Among the first was Dr. Brocklesby who conducted a series of interesting experiments on "a child not two years old, born of musical parents, who was one day remarkable for mirth and good humour upon hearing sprightly airs of musick; this gave occasion to the father and Mr. Stanley to try the effects of different measures, when they had raised the infant's spirits very high by these means. But as the chromatick and grave strains began the child grew melancholy and sad, which temper was removed as soon as the pleasanter musick was played. Thus as I am informed, they could solely by this art raise and allay joy and grief by turns in the infant's mind."

Thousands of practical applications of music therapy were made during the past two centuries. Thus, the Guild of St. Cecilia, toward the end of the last century and the beginning of the present, organized curative concerts for asylums and hospitals with marvellous results. About the same time Dr. Bechinsky, a Russian physician of note, attended a three-year-old child who suffered from sleeplessness due to night terrors. He advised the child's mother to play one of Chopin's waltzes, and the effect is said to have been immediate and satisfactory. In France, Bourdois de la Motte attended a young woman who for eighteen days had been suffering from a severe fever; her pulse was also extremely feeble. On leaving the sick room one day he saw a harp in another room of the house, and it occurred to him to try the effects of music. A harpist was sent for who played for half an hour without any visible results being noticed in the state of the patient. Music was persisted in, however, and ten minutes later the patient began to breathe more easily. The pulse became stronger, and after a hæmorrhage from the nose she began to speak and became convalescent after a few days. In 1893 Ewing Hunter, of Helenburgh, N.B., found that soft music successfully reduced high temperatures in several cases of fever, the greatest reduction obtained being two degrees, from 101 to 99°. Dr. Wimmer, a few years earlier, described the results of experiments with music conducted at an insane asylum. The piano was played for half an hour to 1,400 insane women. It was found that all responded to rhythm; in some cases the pulse rate rose; some became restless and beat time. Melody without rhythm had no effect when it happened to be an air which awakened memories and their associated emotions. With slow music the worst were soothed and even sent to sleep. After several experiments it was noted that all showed improvement.

In 1891 *The Lancet* contained several brief notes on the use of music, advocating its value as a counter-attraction which dulled the acute perception of pain and aided cases of fatigue, worry and certain mental conditions. Dr. Hunter, a year later, proved the benefit of music in his hospital wards, especially for sufferers from pain and insomnia. After a trial of various instruments he considered the lyre and harp as yielding the best results. In 1899, Dr. Herbert Dixon described how he tested the

effects of music on a number of his patients. He found that quick, lively music suited those with slow circulation and lowered vitality or melancholia, whereas soft and soothing music aided night terrors and delirium. Xavier Vernier, in 1903, proved that music can dispel fatigue and act as a stimulus for more work. A greater amount of work was accomplished during the playing of certain types of music than others: allegro, maestro and militaire, largo, and andante movements were found to be accompanied by more production in work than the allegretto movement.

At about the same time when it was realized that music was such a potent factor in human health theories began to crop up which made an attempt to explain how this influence was exerted. Picus of Mirandolo explained that music cured disease by moving the spirits to act on the soul and the body. Coelius Aurenliantus maintained that music charmed the diseased part, causing it to tremble and palpitate.

Dr. P. J. Burette, who made a searching inquiry into the work done by the ancients in relation to music, concluded that, by repeated shocks given by atmospheric vibrations to the nerves and other parts of the body, music was instrumental in effecting a cure. He held that it worked on the afflicted organism by pleasing the ear, thereby diverting the attention from indisposing symptoms; then, by violently vibrating the nerves, it moved the "humour" and the "animal spirits," and broke down malign obstructions.

Richard Browne accounted for the influence of music by the following theory: "It is evident that, if the strings of the fiddle be struck swiftly and boldly, the vibrations of the air must of necessity be short and bold, whereby the nerves will be briskly agitated and give a brisk and lively pleasure to the mind, which by sympathy will invigorate the whole machine. On the contrary, by soft, slow, languishing strokes of the fiddle, the nerves will be so finely and delicately touched, and the sensation so ravished, as to cause the spirits to flow back in gentle modulations . . . And thus it is evident that an allegro by short, quick, and brisk impressions upon the auditory nerves fills the soul with gay and cheerful sensations." In the "History of the Royal Academy of Sciences, France," M. de Mairon accounted for the influence of music in this manner: "It is to the mechanical involuntary connections between the organs of hearing and consonance excited in the outward air joined to the rapid communication of the vibrations of these organs of the nervous system, that we owe the cure of spasmodic fevers, attended with delirium and convulsions." In 1803, Dr. Jean L. Dessessarts read a paper before the National Institute of France, in which he gave his theories of the mechanism of musical stimuli. He stated: "As the nervous system governs the motions of solids, and controls the action of these motions on fluids, it ought to be understood that the nerves when moved, disturbed, or agitated, communicate their state to the parts which they penetrate; they thereby set them to work which belong to their organization, and give them the power of producing in the various humours that fluidity, that course, which brings on and accomplishes a favourable crisis. Music, by imparting to the nerves their life, which in certain maladies is suspended or choked, restores the functions of vitality to vessels and tissues. It can, therefore, have a powerful influence on the secretions and excretions, and become a constant means of healing maladies that are called humoral, gastric, putrid, or malignant."

Hector Chomet, one of the most assiduous of French investigators into the effects of musical stimuli, advanced an interesting mechanical theory. He supposed space to be charged with an imponderable fluid, which he named *sound-* or *tone-ether,* whose existence, he assumed, was everywhere, like the ether of the light and heat theory. It was also always present—active or dormant—like electricity. He said that living beings, and, to a certain extent, inanimate objects, could be influenced by this imponderable tone-ether, and that this sympathy or antipathy to the ether was constantly manifested, producing the most curious effects. Again, this imponderable fluid was capable of modifying and changing its character in many ways, as in the case of light, heat, and electricity. Under certain circumstances this combination of sound has been called music. When we produce this music by mechanical means, we make use of the ever-present but impalpable volume of sound; in other words, we put ourselves in immediate communication with a new force which has a vast influence, for either good or evil, over the human body. Somewhat along the same lines was the theory advocated by J. H. Hausen. His belief was that the tone-ether permeated the whole animal economy and was present in every tissue, finding its way into the lungs and thence being conveyed by the blood to the remotest ramifications of the system.

In his medical lectures, Dr. Leake propounded the theory that music exerted its salutary effects by exciting peculiar sensations in the nerves in the ear, which in turn, communicate with the brain and general nervous system. "Since the inordinate passions of the mind all make their first disagreeable impressions on these parts and occasion low spirits and melancholy," Dr. Leake thought, "that no remedy could equal that of music, which excites a contrary, pleasurable sensation and acts immediately on the same organs." Of the more recent theories, that presented by J. T. R. Davison is of interest: "Music exercises its influence over the human organism in the relief of pain. Pain is a special condition of the sensorium felt as distress and is due to special stimulation, which, travelling from the periphery by other routes, reaches the sensorium and there gives rise to sensation felt as pleasure. In the sensorium these two sensations have to struggle for existence as they cannot exist simultaneously, and whichever of the two adopts itself more comfortably to the reigning conditions of the central organ will gain the day. Where the sensation is that of pleasure, pain will cease to exist, but, as the conditions of the sensorium are not identical in any two cases, music will sometimes be powerless to dislodge pain from its stronghold."

Perhaps the first scientific observations on the physiological effects of music on the circulation of the blood, which partook of the nature of an experiment in the generally accepted sense, were undertaken by the French musician, A. E. M. Gretry (1741-1813), in his "Essai Sur La Musique," in which he mentioned the effects of music on the heart and circulation of the blood, "I placed," he said, "three fingers of my right hand on the artery of my left arm or any other artery in my whole body and sang to myself an air, the tempo of which was in accordance with the action of my pulse; some little time afterward, I sang with great ardour in a different tempo, when I distinctly felt my pulse quickening or slackening its action to accommodate itself by degrees to the tempo of the new air."

Among the more modern experimenters in this particular phase of the influence of musical stimuli were Binet and Courtier, who in 1895 conducted a series of experiments on the capil-

lary circulation in the hand. They established the fact that purely sensorial excitations produced a marked effect on the amplitude of pulsation. Dissonances produced a greater effect of the same nature, and sad music nearly always provoked a reduction. It was found that the rate of pulse remained constant or increased in the case of simple musical elements. Melodies produced an acceleration from 0 to 15. Finally, gay music produced an accentuation of dierotism. Their findings are summarized in the following Table:

Music	*Action on the pulse* *Before*	*After*
Marche Triomphale, Tannhauser ...	84	84
Marche de Faust, Gounod	81	87
L'Epée (Chant), Wagner	86.5	91.5
Marche Hongroise, Berlioz	69	70
La Chauvauchée (Chant), Wagner .	68	83
Printemps (Chant), Wagner	69	73.5
La Rencontre	68	84
Laisse moi contempler (Chant)	73	83

In 1918 Hyde and Scalapino conducted a more elaborate series of experiments in the physiological laboratory of the University of Kansas in an effort to determine the influence of music upon electrocardiograms and blood pressure. The object of these experiments, more specifically, was to ascertain the effects of different kinds of music upon the heart and blood pressure in persons who were known to have musical talent and were fond of music. The experiment was also extended to those who were indifferent to music. The cardiograms were recorded with the Einthoven string galvanometer, its sensitiveness being 1 cm. deflection per millivolt. The pieces selected were, (1) Tschaikowski's Death Symphony, characterized by slow, tragic movements; (2) the Toreador Song from Carmen; and (3) The National Emblem, a stirring, lively march by Sousa. The effects of other pieces of music had been tried, but the results seemed to indicate that the effects of those pieces were also familiar to the subjects, and were influenced by associative memory.

The data from subject A, who was fond of music, were checked with those of the other two subjects, but his, being most complete, were chosen by the experimenters for publication.

The experiments were conducted under fairly constant subjective and weather conditions, and about the same hours of the day. The cardiograms, pulse and pressure curves were secured before and immediately after, and also from 5 to 10 minutes after the music had ceased. But while listening to the music only the cardiograms were taken, because it seemed that the latter were affected by the manipulations necessary to secure blood pressure records. For the experimenters' own data, the subjects' cardiogram, pulse and pressure were obtained, without the influence of music, at different hours of the morning, the forenoon being the time during which all the tests were made. It was found that ordinarily the pulse rate and pressure varied somewhat during the forenoon. It was also found that the minor tones of the symphony caused an increase in heart action, but a fall in blood pressure. The Toreador Song from Carmen produced an increase in blood pressure, but decreased current action. It seems, therefore, that this kind of music has a stimulating effect upon the circulation by increasing the blood pressure and pulse rate, while lessening heart current action. The National Anthem caused a slower pulse rate, and had a stimulating effect on the heart, somewhat similar to that of the Toreador.

Towards the end of the last century the Italian physiologist Patrici conducted a series of experiments on the influence of musical stimuli on the circulation of blood in the brain. A boy named Favre, aged 13, of Bramans, in Savoy, while acting as an assistant to his employer, a woodcutter, was severely wounded in the head by a glancing blow of an axe. Through careful treatment he was finally restored to health, although the wound still remained more than three inches in length, cleaving the bones of the skull for the entire distance. When the wound was finally healed the bones did not fully cover the exposed brain, in consequence of which changes in the circulation of the blood in the brain could be detected accurately. The boy himself was docile, and intelligent. The points that Patrici set out to ascertain were first whether the circulation of the blood in general is influenced by music; then whether that of the brain is more or less influenced than that of the body.

For determining the progress of the circulation an apparatus was adopted, consisting of a closed cylinder of glass for holding the arm in water and a registering apparatus connected with the needle of a galvanometer. For registering the pulse in the brain a cap of gutta percha was made, with an electrical connection capable of showing the slightest modification in volume or pulsation. After a carefully executed series of experiments the following facts were elicited. (1) It was found that under the influence of music the pulse in the arm was elevated in the same proportions as that of the brain. (2) Under different modes of music different tracings were obtained. It was found that under certain melodies while the brain circulation expanded, that of the arm contracted. (3) The depressing or exalting character of music does not correspond with the abasement or elevation of the plethismographic curve. The circulatory effects of music are directly related, not subordinate, to the movements of breathing. It was not decided whether the variations in the volume of the brain are automatic nervo-muscular functions or the passive reflections of vaso-motor phenomena in other regions of the body.

Music exerts equally profound effects on the other systems of the body. Binet and Courtier, who were among the pioneer investigators in this important field, noted the influence of musical stimuli on respiration. The reactions of a single subject were studied. In one series of experiments, isolated tones, chords and musical exercises possessing no intellectual or emotional associations, were used. These sensorial stimuli produced no respiratory modification, except an acceleration of from 0.5 to 3.5 addition respirations per minute. The acceleration varied directly with the increase of the movements, and was greater for the minor mode and discordant sounds. Musical selections, chiefly songs, arousing emotional associations, according to the introspection of the subjects, varied in their

influence, according to the influence the tone evoked. Sad melodies accelerated respiration by 2.6 on the average, considerably diminished the amplitude, and produced irregularities in both acceleration and amplitude of respiration. Gay music, *i.e.*, military marches, produced an acceleration of 3.8 and showed less tendency to reduce amplitude. A third class of melodies evoked complex and unclassifiable emotions.

The evaluation of musical stimuli upon muscular activity was undertaken several years ago by Prof. Seashore, who has done considerable work along this line. He found that the greatest pressure which could be exerted by the thumb and finger grip during silence was 4 kg. When the "Giant's Motive," from "Das Rheingold", was played the grip was increased to 4.5 kg. Music also tends to reduce fatigue and consequently increase muscular endurance. In 1887, Lombard observed the reinforcement of knee-jerks caused by music, while making a study of musical influence on the nervous system. He found that the knee-jerk varied distinctly with the intensity of the auditory stimulus. There was an increase and a decline in the extent of the knee-jerks as the music approached and receded.

From the evidence before us it can be stated that musical stimuli have a definite influence on all the systems of the human body, and in this manner exerts a profound effect on human health. Good music and good health are intimately associated with each other. Dr. Ingegnieros, several years ago, after devoting many years to the study of music and human health, declared that (1) musical stimuli, like all sensorial excitations, determine an increase of the general physiological activities of the organism; (2) musical stimuli in certain well-known conditions determine the transient functional reactions in the organism that characterize an emotion; (3) physiologically, functional reactions that are specific of musical emotion do not exist; it is a matter of reactions common to the emotions in general, determined by music in certain conditions.

In conclusion it may be stated that music exerts its influence on the human body in the following ways: (1) increasing metabolism; (2) by increasing or decreasing muscular energy, according to the type of music played; (3) by accelerating respiration and decreasing its regularity; (4) by producing a marked but variable effect on the volume, pulse and blood pressure; and (5) by lowering the threshold for sensory stimuli of different modes.

Medical Economics

A SPECIAL MEETING OF THE VANCOUVER MEDICAL ASSOCIATION

A special meeting of the Vancouver Medical Association was held at the Medical Dental Building Auditorium on December 14, 1933, to receive the report of the Committee for the Provision of Medical Care and to act on certain recommendations presented by this Committee.

A general invitation had been issued to all members of the profession practising in the Vancouver area, and the President in his opening remarks made it clear that, while the Vancouver Medical Association had called the meeting, it was primarily a meeting of the medical profession and not of the Association, and that all medical men were asked to take part in the discussion and in the voting.

Dr. Vrooman presented a report in two parts. The first was a report of the work of the Committee since its appointment on January 3, 1933. This Committee had held a great many meetings during the year, had gathered data from various parts of Canada, especially Ontario and Manitoba, concerning the treatment of relief cases, and had met with City Council and City Relief Departments and with members of the government, in order to find a solution to the problem and to obtain remuneration in some form for the medical men who were treating relief cases. He reported that up to date all these efforts had been in vain except in regard to maternity cases, where a decision had been reached whereby medical men confining maternity patients on relief in their homes would receive a total of $19.90 and the Victorian Order of Nurses $10.00, paid jointly by city and provincial government. This sum represents the amount that would otherwise have been paid to the Vancouver General Hospital for the care of these patients. To date sixty-five maternity relief cases have been notified, thirty-eight patients have been confined and sixteen cases have been partially paid for. The city has paid its share, but up to date the provincial government, through a misunderstanding, has not paid its contribution; but the Committee had been assured, verbally, that the necessary vouchers had been passed and will eventually be honoured. Until the last few days the Committee had felt that a deadlock had been reached, and had been ready to ask for its discharge and to recommend to the Association a resolution whereby all medical men would refuse to attend the relief cases until an agreement could be reached with the city. During the past few days, however, developments had occurred which had altered the complexion of matters and had induced the Committee to prepare a series of recommendations for action by the Associa-

tion. Inasmuch as this matter is *sub judice,* it is felt unwise to publish these recommendations in full, but a brief summary would be as follows:

The Committee does not feel that relief cases should be paid for on a *per capita* basis nor that the work done for them should be limited to a certain number of men, but that every practising physician should be entitled to take such cases, that the patients should have free choice of their own doctor, and that the work should be paid for by an allotment to the profession of a certain sum monthly by the city and provincial government. This sum would be received, doctors would send their bills in according to regular schedule fees, and the available money be divided *pro rata,* the rate being struck each month for that month. In this way it was felt that in considering the question of health insurance later on the profession would not be placed at a disadvantage. Moreover, it would be fairer to the men who are doing a great majority of relief work. This money would be used only for the payment of work done in the patient's home or in the doctor's office and no provision would be made, at present, for hospital work.

The Committee on Medical Care was authorized to appoint one or more members to go to Victoria to interview the Provincial Government in cooperation with representatives from the City Council. It was also empowered to conclude an agreement with the city and province or with either one. These recommendations were dealt with *seriatim* by the meeting going into committee of the whole, with Dr. Pedlow in the Chair. There was a very free discussion and many points were brought up and dealt with. During the discussion it was pointed out by the Committee that this scheme applied only to patients on relief, that it was not intended to be understood as an adequate method of payment, but that under existing circumstances it was felt that the important thing was, first, to secure acceptance by the city and provincial government of the principle that medical men should be paid for their work for relief; secondly, that this should be thrown open to all medical men; thirdly, that we should act as a unit in whatever action was taken; and fourthly, that nothing should be done which would constitute a damaging precedent in the event of future negotiations with the government regarding health insurance.

The Eye, Ear, Nose and Throat Section, represented at this meeting by Dr. R. B. Boucher and Dr. E. E. Day, referred to their own action with regard to hospital cases. Great sympathy has been felt by the profession with this section, who have undoubtedly been very greatly imposed upon in this matter of relief patients, and it is felt that due consideration must be given to their position; but the Committee feel strongly that the important thing at this juncture is to proceed one step at a time and to consolidate our gains as we go.

Some twenty-nine men took part in the discussion, which will give an idea of the interest shown in the subject. At the close of the meeting a report was adopted, the Committee rose and reported the meeting, and their action was confirmed.—*Bull. Vancouver Med. Ass.,* 1934, **10**: 73.

THE MEDICAL RELIEF PROBLEM IN ALBERTA

BY G. E. LEARMONTH, M.D.,
Calgary

Though the Federal Government, within the past few months, has endeavoured to assist a limited number of physicians in this province, through appointments to make physical examinations and care for the single unemployed in various camps, yet the first evidence of any real constructive effort, of any magnitude, to help physicians to surmount their difficulties in connection with the problem of remuneration for services rendered to the unemployed married men and their families, appeared in the local press early in January, 1934. This was to the effect, that Premier J. E. Brownlee had stated that medical attention on an organized basis to married unemployed men who are on relief may be undertaken by the Provincial Government at an early date. The Government was considering two ways in which to handle the situation. The first was to appoint a certain number of physicians to do the work, in line with the number of persons on relief. The second was to grant a certain sum to the Alberta Medical Association or local medical society, to disburse the amount as each saw fit. The latter plan is considered to be the better one. This is the first glimpse at the silver lining of the cloud which has hung over the land for a period of almost four years, so far as physicians in this province are concerned. Unemployment was on the increase in 1930, and towards the end of 1931 began to reach an acute stage, which was accentuated in 1932 and still more so during 1933.

In November, 1931, in reply to a communication from the civic authorities regarding the care of the indigent sick, the members of the Calgary Medical Society stated that they would continue to give their professional services, as they had done in the past. As the number on relief in this city greatly increased during 1932 and in 1933 and it was apparent that neither the provincial government nor the civic administration intended to compensate our physicians in any way for the large amount of services rendered, special meetings of the Calgary Medical Society were held during May and early July, 1933. Among the resolutions endorsed were the following:

1. "That the medical societies of the Province of Alberta be communicated with and asked to forward petitions to the Right Hon. R. B. Bennett, the Prime Minister, and to the Hon. Mr. Gordon, the Minister of Labour of Canada, and to Premier J. E. Brownlee, asking that some provision be made for remuneration of medical men for indigent relief cases."

2. "That the medical men of the city of Calgary desire to draw to the attention of the Calgary City Council, that heretofore, they have been caring for the indigent of the city without remuneration and now ask that the Mayor and Council consider some means of compensating the medical men, for rendering this service."

So far no direct action has resulted. In Calgary, unemployment relief, in which the federal and provincial governments and the city have participated, has provided an allowance for a man and his wife and for each child from which the costs of rental, food, heat, light and water are paid. Where hospital care is required one dollar and a half a week is deducted from the amount allowed to the patient's family. Drugs and dressings are furnished by the city on the physicians' orders for patients not in hospital. No provision has been made for the physicians' services. Single unemployed men are examined, and, if found physically fit, are sent to the different camps, where each man receives twenty cents a day. If they have not suitable clothing they are furnished free with whatever is necessary. They are properly fed and sheltered, but must work.

There are two types of camps under the direction of the Department of National Defence; the first includes ex-service men, the other civilians. The Provincial Government also directs a number of civilian camps.

At Calgary, local physicians have been appointed to examine for fitness all single unemployed men before they go to the various camps, with authority to take a fourth in case of necessity. One physician examines all the men for the military camps on the Banff highway, also all the unemployed ex-servicemen; the others examine all the civilians. For these examinations, a rate is set of one dollar per man for the first five in any one day, and then fifty cents for all others above this number.

The single men and women in Calgary who are unfit are sent to the first-aid station of the Red Cross Society, where a physician is in charge.

In Edmonton, physicians are paid a fee of three dollars for a first call in attendance on unemployed patients. No other allowance is made for any other professional attention.

In the city of Lethbridge, a sum of $250.00 a month has been set aside for relief purposes. The members of the Lethbridge Medical Society agreed to care for the unemployed who are sick for this amount, and arranged among themselves the following scale of fees: (1) First visit or office call $2.00 (These are the preferred claims and are paid for in full). (2) Maternity patients, a fee of $10.00. (3) Minor surgery, $10.00. (4) Major surgery, $25.00. After the preferred claims are paid the balance is pooled and paid in proportion to the work done. The physicians there are fairly well satisfied.

In Medicine Hat the physicians have not received any assistance, and not until the end of December, 1933, did they request that they should be remunerated by the city for their services to those on relief.

In local improvement districts, relief is distributed by the provincial government. Physicians present their accounts to the Relief Commission, and if the patient is indigent a portion of the physician's fee is paid. This department is particularly anxious that no patients are sent to a hospital when they could be cared for in their own homes. With maternity patients, where there are several children, the Relief Department takes the stand that they do not require hospital care. In many instances letters have been sent to the family or to a district nurse to call on a "handy" neighbour woman and not to call a doctor.

Some municipalities have employed a physician on a salary, to care for the indigents as well as act as medical officer. In some of the smaller centres groups of citizens have engaged a physician at $25.00 per year paid in advance; in other instances at $18.00 per year, the half cash six months in advance. Mileage is charged at the rate of twenty-five cents per mile one way, if the roads are good, and fifty cents if the roads are bad. If a patient discontinues the contract, he cannot re-enter another year unless he pays up the arrears. It has been found that families anticipating the need of a doctor's service enter for a year, get more than their money's worth, and then discontinue the contract.

Throughout Alberta, the financial problem is still a serious and ever present one with the majority of our physicians. They have so far weathered the stormy course, and, with hope and courage, I am sure the rest of the journey will be in calmer seas. The intimation that the Dominion Government, may share or assume the cost of medical attendance to persons on relief, gives us additional hope that gradually there will be a return to better conditions.

MEDICAL SERVICE IN ALBERTA

The following is a summary made by Drs. Wilson and Archer of the answers to the questionnaire sent to the profession, that is 227 of them.

1–A. The present system of medical service is satisfactory to part of the people, but not to all. The independent honest person of moderate means suffers most. This opinion was expressed in the proportion of 3 to 1.

B. It is not under present economic conditions satisfactory to the profession, 4 to 1.

2–A. Adequate medical service is now available to most of the people in so far as professional personnel is concerned, but owing to the present economic conditions distribution of this service is not uniform, and not all can avail themselves of existing services, 2 to 1.

3–A. Conditions of practice are not satisfactory to medical men, financially, at present, 9 to 1.

B. Patients do not consult us early enough, 3 to 1.

C. Physicians could do better service for their patients if the patients were not afraid of the expense, 10 to 1.

4. In a majority of 20 to 1, the men expressed themselves, that they would be in favour of a scheme of health insurance if it could be made satisfactory (mutually); but a fairly large body of opinion was expressed which doubted the probability of any scheme being set up which would be mutually satisfactory, although a large majority, apparently, would be willing to try it.

5. Many varied suggestions were made, but we have no concrete conclusion to offer along other lines, except that existing laws *re* indigent sick should be made operative.

6–A. Apparently a majority do not think it should include everyone. They think it should be province-wide and compulsory for the groups included, but not to include everyone at first, 3 to 2.

B. It should include only those under a stated income, apparently around $1,800.00.

7. It should not include cash compensation for loss of time to the insured. This should be done later, if at all, and by a separate fund, 3 to 1.

8. The control should be by central boards, 7 to 1.

9. The profession is almost unanimously in favour of a continuation of the principle of competitive practice and the payment for services rendered, 26 to 1.
The panel system was favoured, only as a possibility, by about 1 out of 16. The straight State Medicine type of service and payment by salary was not favoured, 7 to 1.

10. The majority consider that the physician himself should have the sole right to determine his place of residence and the territory in which he would practise, 5 to 1.

11. Doctors should be allowed to pursue independent practice if they so desire, 15 to 1.

12. If physicians were engaged at an adequate salary:

A. Opinion was divided as to whether this would be more satisfactory to the physician, but the majority are opposed to the salary basis.

B. The majority do not think it would be in the interest of the patients, 2 to 1.

C. The majority doubt if the present high standards of work maintained by most doctors would be always kept up, 2 to 1.

D. The danger of competitive bidding for positions is real. Unless adequate standards of salaries are maintained the quality of the work must suffer, 4 to 1.

E. It is always difficult to get busy doctors to keep adequate records, but it is possible if a satisfactory scheme for records is evolved.

F. The majority fear the danger of unnecessary calls on a physician's time, 9 to 1.

G. The majority think there would be danger of slackness on the part of the physician, 3 to 1.

H. The majority think that there would develop a situation where the practice of this profession in the care of the sick might be hampered by bureaucratic control.

A strong feeling was expressed by many members of the profession that the conditions of practice are not satisfactory and that some improvement is imperative. This, of course, has become most evident with the failure of existing legislation to materially help with the care of the indigent and the problem of the care of the growing list of persons on relief. In spite of this, a timidity is expressed regarding making drastic and far-reaching changes in the basis of practice at a time such as this, when conditions are such that many men would accept almost any conditions that would ensure them a respectable living.

There is another thoughtful group who think that a change in the conditions of practice is imminent and desirable, even regardless of the anticipated financial relief which might follow to many of the profession. These are impressed by the failure of many, if not most, people of moderate means to provide a safeguard for their emergency sickness, and think that the present system has not worked well enough at any time.

There is still another group, small but including men of outstanding ability and fine judgment, who think that no system will work as well as the present one. They think that its failure has largely come about through the facts that the governments, provincial and municipal, have not realized that the care of the indigent is the responsibility of the state. They have apparently been unable to frame legislation which would operate with any uniformity or satisfaction. These frankly desire to have this problem of the care of the indigent solved immediately, and certainly before any effort is made to handle other groups, for which they think the present system not only adequate but the best that is in sight. There is however, a fairly large majority of the profession, who are looking forward to a change in the basis of the practice at an early date, and if this is to come they are willing to assist in any way that is possible. They are anxious that such a change may be the most satisfactory possible from the standpoint of:

1. The successful practice of scientific medicine.

2. The maintenance of all that is of value in the present system, particularly as it affects the somewhat imponderable but very vital relationships between doctor and patient. This necessitates freedom of choice by the patient of the physician who is to attend him, and the retaining of as high a degree of independence as possible by the practitioner.

3. The system in this province must stress the importance of, and therefore protect the interests of, the family physician.

4. There must be an arrangement for consultation and reference to specialist within the scheme, but only or mainly, through the family physician.

5. The basis of payment, except in isolated areas and public health services, should be payment for services rendered.

G. E. LEARMONTH

Health Insurance. — Dr. T. E. Brown, of Taber, Alta., writes us as follows under date of December 2, 1933.

"Under the heading 'Medical Economics' the November issue of the *Canadian Medical Association Journal* discusses a subject in which a large majority of medical men and a great number of the public, too, are interested to-day. When times were good most of us were content to struggle along, endeavouring to uphold the time-worn traditions of our profession and care for the sick-poor without remuneration. But even in those days there was dissatisfaction. A great many medical men felt that their time and services were being taken advantage of; some of the sick, unable to meet their obligations, were not satisfied that they were getting the care their condition entitled them to, and the man who endeavoured to pay his disability accounts was not entirely satisfied that he was not paying for the man who couldn't or wouldn't pay. There is an element that will not, if they can avoid paying, settle their medical accounts.

"Why should this state of affairs obtain? Under none but ideal conditions do I see how it can be entirely eliminated, because the practice of medicine is an art, not a cut and dried business. On the other hand the successful practice of medicine must be conducted on lines involving certain elementary principles of business. The burden of looking after the indigent sick has become too great. There is no real reason, except our outworn traditions, why the medical profession should not seek relief from this evil. I believe surcease from this heavy load would evolve to the advantage of the people and the profession. As a general practitioner in a country district, I hear the comments of other men working under similar conditions to mine. I judge there are many other districts not unlike this one. A considerable part of our worries are economic. Maybe they always have been and will continue to be, but certainly, we hope, not to the same extent as at present. This state of affairs is neither to the advantage of our practice nor of the people we are endeavouring to look after.

"We are told that the practice of medicine is bound to undergo a change; there are indications that the change is in the offing. At one of the meetings during the Alberta Medical Association Convention this past fall a member of the provincial legislature, addressing the meeting, advised the Association of the necessity of formulating concrete plans for a change that was certainly coming to this province. It is up to every practitioner of medicine in the Dominion to do some clear thinking on this subject. A scheme must be formulated that will appeal to the public; at the same time we must endeavour to protect our rights as a profession and individuals. Considerable thought and time is being given to this matter, both in the provinces and by representatives of the Canadian Medical Association. However, after listening to the discussions at the Alberta Association Meeting and various other discussions, I think we are far from any unanimity of opinion as to what should be done yet.

The remuneration of most men in the profession, although they work hard, is not commensurate with the work they do. In the struggle for existence they have little leisure or time for study, and the taking of post-graduate courses involves no little sacrifice, so that far too few are taken. A great many of the public require medical treatment who do not apply for it because they lack the means; others, for the same reason apply too late. At the present time the onus for this state of affairs is, to a certain extent at least, being cast upon the medical profession, possibly not so much as a whole as individually.

"These evils, in my humble opinion, might to a considerable extent be overcome by the adoption of a form of health insurance. I believe it should be compulsory, and every individual should be obliged to contribute to a health insurance fund according to his or her earnings. The medical men should be paid for the work they do, not on a salary basis, except those holding various public health positions. Every patient should have the right to choose his physician. There should be free hospitalization, when necessary, with examinations, consultations and treatments, paid for out of the fund. There should be no remuneration for loss of time due to sickness. It would be necessary to place salaried men, or supplement the incomes of those in certain sparsely populated parts.

"The free choice of doctor would serve to keep the standard of the practice of medicine higher than if the physicians were on a salary basis. The spirit of competitive practice would remain, with its advantages, and some of the disadvantages removed. If all work done were paid for medical fees could be greatly reduced. Non-payment for loss of time due to sickness is advisable to eliminate malingering as much as possible. There should be no dictation by any body as to where a medical man should practise.

"The plan roughly and imperfectly outlined herein is not original. It requires a great deal of consideration as to method of administration, financing, and local application, but it appeals to me as the most feasible, involving the least radical changes and offering fewer possibilities of abuse than any other."

Association Notes

The Sixty-fifth Annual Meeting of the Canadian Medical Association at Calgary, June 18th to 22nd, 1934

Alberta and the City of Calgary

In 1905 the Province of Alberta came into existence; prior to that time, the territory now forming the Provinces of Saskatchewan and Alberta, with the outlying lands, was known as the Northwest Territories. The era of ranching, as the prime industry, was largely over, and farming, with a great influx of settlers, began to take its place, and before many years farming had so far outstripped ranching in the value of production that it is now Alberta's chief industry. It may be stated, however, that Alberta is still the leading cattle-raising province of the Dominion. There are about eighteen million acres of improved farm lands in this province. Owing to lack of moisture in some areas from year to year, some three hundred and thirty-five thousand acres are under irrigation schemes which were undertaken at a large expenditure of money.

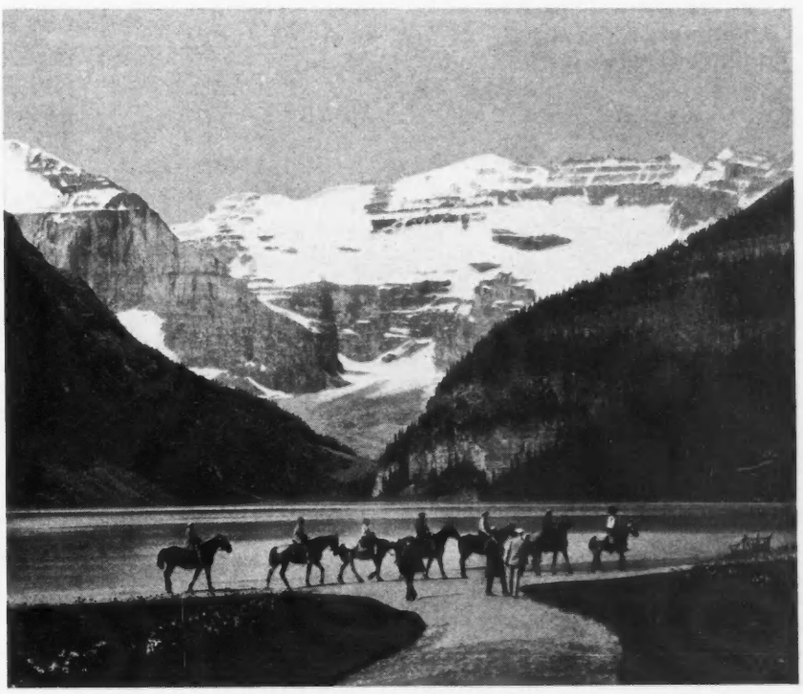
Within the past few years, also, Alberta has become the largest oil-producing province in the Dominion, with seven hundred and fifty thousand to a million barrels a year of high grade oil to its credit, most of which comes from the famous Turner Valley field, forty-one miles southwest of Calgary, which area continues to grow in importance as it is extended. Nature has given Alberta the greatest natural gas fields in the British Empire. Natural gas has been found from one end of the province to the other. It is distributed to the cities of Calgary, Edmonton, Lethbridge and Medicine Hat and also to twenty towns and cities along the pipe lines, so that 95 per cent of the homes in the southern centres are heated by this means. It is said that Calgary has more gas ranges per capita than any city in the world. The vast deposits (15,000 square miles) of bituminous tar-sands in northern Alberta, from which oil has been abstracted and a fine road covering has been made and laid down in various districts, have attracted much outside interest.

The coal resources range from semi-anthracite to lignite, and are stated to be one-fourteenth of the known amounts in the world, with an estimated reserve of 1,059 millions of tons. Approximately 87 per cent of the coal deposits of Canada are in Alberta.

From the swift streams which flow down from the mountains eastwards there is much power available for hydro-electrical purposes. To the west of Calgary, on the Bow river, and at the Kananaskis and Horseshoe Falls, are the plants of the Calgary Power Company, with a combined total of 32,380 horse power, from which electricity is distributed to the City of Calgary and over a wide area of rural Alberta, even into the Province of Saskatchewan.

Furs of a very fine quality, chiefly from the northern part of Alberta, form a valuable annual product; silver foxes, and even caracul lambs have been raised in the district adjacent to Calgary.

Alberta has a very attractive climate, especially from the point of view of its fine bracing qualities, with a great abundance of sunshine and clear air, both in winter and in summer.



Lake Louise

It is little wonder that the term "Sunny Alberta" has been applied. Calgary, with an altitude of 3,389 feet above sea level, averages well above two thousand hours of sunshine each year. In winter time, though we have periods of cold weather, these are not unduly prolonged, owing to the beneficent Chinook wind, which is said by some to come across the Rocky Mountains from the Pacific Ocean. These winds are most noticeable in the southern part of the province. Not infrequently there will be a sudden rise of over seventy degrees Fahren-

heit within a few hours, in winter weather. The air is particularly dry and even during the periods of cold weather, and is very invigorating. During the warmest summer days the nights are almost invariably cool, a fact which appeals to those who come from other parts of the Dominion, where the nights are hot and sultry.

Calgary's development has, like that of other western cities, been phenomenal, from the early days of this century when there were only a few thousand dwellers to the present time with its eighty-five thousand inhabitants. Much of its picturesqueness has been lost since this city was known in the "eighties" and "nineties" by the soubriquet of "Cowtown", from the association which it had with the ranching industry, though it is still the leading livestock centre in the province. With the growth of the city, more and more attention has been given to beautifying the parks and residential areas with trees and gardens, so that in summer time Calgary is a very attractive city. All of the public utilities, including the electric light and power plant, a waterworks system, including the new Glenmore Dam on the Elbow river, southwest of the city, are owned and operated by the city. The Glenmore Dam and purification plant were completed recently at a cost of four million dollars. Supplying the plant there is a large storage reservoir. A city of two hundred thousand inhabitants could be well provided with excellent water by this new system, so that for many years to come an adequate supply is ensured.

Moraine Lake

In the year 1919 the Calgary General Hospital, which since its inception had been supported and controlled by citizens of this community, was taken over by the city and from that date has remained a municipal hospital, controlled by a representative civic Board of Management. The Isolation Hospital is likewise under the same management. The superintendent of the General Hospital, Dr. W. H. Hill, D.P.H., is also medical officer of health for the city.

G. E. LEARMONTH,
For the Committee on Publicity.

Hospital Service Department Notes

The Cooperation of Doctors is Sought in Admission of Patients

One of the hospital problems which is a perennial topic at all hospital conventions is that of the various factors which are involved in the admission of a non-paying patient to a public hospital. In most provinces legislation has been effected whereby, upon proof of indigency and of residency, the municipality from which such patient hails is required to pay a per diem grant to the hospital as part payment for the care of such patient. Most hospital acts set forth in detail the formalities required to protect both hospital and municipality; "residency" is defined; "indigency" is either defined or court decisions are utilized, and periods of time are set forth in which the hospital must notify the municipal authorities and in which the municipality must protest residency or indigency or else accept responsibility for such patient. In some provinces it is obligatory for the patient to get authority from certain municipal officers, a "county" or "city order", before admission; some provinces exempt emergencies from this requirement, but this then leads to the frequent local controversy, "What constitutes an emergency?" Some patients claim admission as paying patients, and then, a few days later, the patient is found to be destitute, at least of cash, and a prolonged controversy with his municipality may be precipitated. Frequently the authority for the care of such patients is not

All communications intended for the Department of Hospital Service of the Canadian Medical Association should be addressed to Dr. Harvey Agnew, 184 College Street, Toronto.

finally refused until long after the patient has received his hospital care, and during the last few years the more frequent efforts of many municipalities to reduce expenditures by evading responsibility through various loopholes has resulted in considerable loss to hospitals.

It has been emphasized at hospital conventions, and not without logic, that the doctor referring the patient can be of considerable assistance to his hospital in such instances. As a general rule he is fairly conversant with the state of the family finances, particularly in smaller centres; he could inform the family, where a county or city order seems necessary, of the preliminary procedure required, rather than permit the patient to be brought to the hospital door, perhaps on a stretcher and in the wintertime, without properly signed authority; he could urge cheaper accommodation where the family finances would seem to so indicate, for on such occasions, as in dealing with the undertaker, the family or relatives frequently feel that it is not seemly to consider costs.

Moreover, in the case of paying patients, the physician can be of great assistance to the hospital by explaining to the patient the possibility of "extras" for laboratory charges, x-rays, the care of the baby, meals of special nurses, etc., which frequently come as quite a shock to the patient with limited funds. It is true that the doctor may have so much difficulty inducing the patient to go to hospital that he hesitates to interject such chilling suggestions, but this frequent misunderstanding makes it very difficult for the hospital to collect and has left the doctor open to some reproach by his patient.

It is urged that all hospital staffs take up this matter seriously and arrange with the superintendent or chairman of the board of trustees that the various admission requirements be fully explained to the medical staff. To gain the fullest cooperation it is advisable that the various details be set forth, not only at a well attended staff meeting, but by bulletin or letter sent to every doctor connected with the hospital, such letter to be repeated at least annually.

METHYLENE BLUE SOLUTIONS IN POTASSIUM CYANIDE POISONING.—J. C. Geiger reports two cases which demonstrate that methylene blue, intravenously, is useful, definitely beneficial and successful in the treatment of cyanide poisoning. The dye can be used in quantities up to 100 c.c. of a 1 per cent solution (1 gm. of the dye) within a period of one-half hour without untoward symptoms. The use of methylene blue, even to the extent of 100 c.c. pf the 1 per cent solution, did not produce measurable quantities of methæmoglobin in the blood of these particular cases.—*J. Am. M. Ass.*, 1933, **101:** 269.

Medical Societies

The Edmonton Academy of Medicine

The December meeting of the Academy, which took the form of the Annual Dinner, was held at the MacDonald Hotel on December 6th, about 90 guests being present.

The meeting was presided over by the President, Dr. H. Orr, the Province of Alberta being represented by Lieutenant-Governor Walsh, the City of Edmonton by Mayor D. K. Knott. The main speaker of the evening was Major-General, Senator W. A. Griesback, who entertained the assembly in a most witty and versatile manner.

The Calgary Medical Society was ably represented by Dr. McGuffin, of Calgary, and the Dental Association by Dr. T. F. Macdonald.

The election of officers for 1934 resulted as follows, *President,* Dr. Fulton Gillespie; *Vice-president,* Dr. H. K. Groff; *Second Vice-president,* Dr. Gordon Gray; *Treasurer,* Dr. Irving Bell; *Secretary,* Dr. M. R. Levey; *Committee,* Drs. H. C. Jamieson, J. Scott and G. F. Williamson.

T. H. WHITELAW

Western Ontario Academy of Medicine

A clinical meeting of the Western Ontario Academy of Medicine was held on Wednesday, December 13, 1933. Dr. A. T. Bazin, of Montreal, discussed cases of œsophageal obstruction, peptic ulcer, gall-bladder disease, acute appendicitis, and acute osteitis. The most interesting and suggestive observations in each case concerned; the causative factor and treatment in œsophageal obstruction; the progressive change in symptoms synchronous with the progressive anatomical changes produced by adhesions in gall-bladder disease; the choice of operation between partial resection of the stomach when the secretions are highly acid and enterostomy when the secretions are less acid in peptic ulcer; the conservative draining of the abdomen in generalizing peritonitis in acute appendicitis; the anatomical relationships of the periosteum and capsule of joints, of the synovial membrane and articular and epiphyseal cartilages, and of the progressive movement of bone abscesses with the increase in size of the bone affected in acute osteitis.

The demonstrations were profusely illustrated with charts, x-ray films and lantern slides.

The meeting was the largest held for some time, some two hundred, including undergraduates, being present.

J. H. ELLIOTT

Special Correspondence

The London Letter

(From our own Correspondent)

A quiet revolution in the health services of London and to a lesser degree of the whole country has been proceeding during the past few years, and there is more to come. It is perhaps not always realized that the London County Council when it took over the services of the poor-law authorities as well as the fever hospitals and the care of orphan children, etc., became in a single night, so to speak, the responsible authority for the largest municipal hospital system in the world. A recent report shows that under the care of the London County Council are 74 hospitals with a staff of 18,000, and an annual bill for maintenance of about four-and-a-half million pounds. Great improvements have already been made in, or are planned for, many of the institutions, and a special form of out-patient work for accidents is being developed, continuation treatment, ante-natal and post-natal supervision, and consultations in particular instances. An example of the extent of the work now undertaken is shown in the fact that during 1932 more than one-sixth of all the births in London took place in the maternity wards of the municipal hospitals. Another department for which the Council has assumed responsibility is the "District Medical Service," which is the provision of domiciliary medical aid for those who cannot otherwise afford it (the old "poor-law" doctor). This has been reorganized and is subject for review in two years' time. Meanwhile the British Medical Association has issued a valuable memorandum on the whole subject of the supply of medical aid to the poor in their own homes. It is strongly urged that the "free choice" method should be employed in the future, so that all practitioners in any area can be available on a special panel and attend patients of the poorer class in exactly the same way as they attend their present insured patients. Payment should be arranged on a capitation basis, or be made per item of service rendered. Many areas are already working schemes on these lines, but there is still a great deal of reorganization to be carried out, and the British Medical Association is strongly opposed to the appointment of whole-time district medical officers in the future. Yet another aspect of the slow changes occurring in our health services is shown by the growth of such activities as the "London Public Medical Service." This is in effect a revival of the old type of contract practice, but the regular small subscriptions (instead of fees) are collected by a central organization, and neither doctor or patient loses any independence. A meeting held in London recently discussed various aspects of the service which has very obvious advantages to the public but less obvious ones to the doctor unless he can secure a fairly large list, since at first any such scheme is bound to attract more especially those individuals and families where sickness is common. Much of the discussion at the meeting took place round the subject of advertising the service. The Dublin meeting of the British Medical Association approved of this in principle, but, while there was a great deal of support at the meeting in London for leaving the spread of knowledge of such a service to the doctors themselves, the possibility of advertising was not formally condemned and yet another aspect of the revolution in the profession may well be the appearance of "group advertisements." Already one such has appeared in an evening newspaper in favour of a public medical service. Soon, perhaps, on the lines of the Post Office, there will be attractive posters on the horders with some such slogan as "Make the Doctor your Best Friend" or "Call in the Doctor Early and Save the Undertaker's Bill."

Their Majesties the King and Queen recently visited St. Mary's Hospital in order to open the new medical school and pathological institute. The visit was a fitting tribute to the importance of this new development, for despite the conditions of the financial world the authorities at St. Mary's have been able to rebuild completely out of British funds, and the public has shown that the training of medical students has an equal claim to its charity with the more obvious care of its sick in the actual hospital. The King was able to express his gratitude for the skill of a nurse from the hospital who had cared for him during an attack of typhoid fever in his younger days—yet another of the many examples of where skilful nursing has earned the gratitude of some distinguished patient for the large training schools in London. The new school is thoroughly modern, and the modern student will find a garage for fifty cars as well as a magnificent swimming bath, a squash racquets court, and a gymnasium. The pathological institute is likewise thoroughly up-to-date with the animal houses heated by the modern "panel" system and all shelves hung from the ceiling so that walls and floor can be hosed down. It is said that one of the exhibits which most attracted the Royal visitors was a floral design of welcome carried out by culture of different bacteria on large plates, the various colours being obtained by the use of special organisms or special media. Perhaps this will also prove a way of advertising the profession in the future!

ALAN MONCRIEFF

London.

The Edinburgh Letter

(From our own Correspondent)

Professor Campbell, of Aberdeen University, in the course of a recent lecture on "The use and abuse of drugs" delivered at Marischal College, Aberdeen, discussed the subject of the quack. Why was it, Professor Campbell asked, that people who would not entrust a broken watch to anyone but a skilled watchmaker actually entrusted their bodies to unqualified practitioners? The answer to that question might be obtained by reflecting on the intentions and methods and results of quacks and quackery. Behind the term quack and charlatan lay the idea of advertisement, and the three prime qualities of the quack were his dangerous ignorance, his brazen impudence, and his knowledge of the almost universal credulity of men when they were sick. Perhaps the most notorious and most successful quack of the eighteenth century was Joanna Stephens, who actually succeeded in inducing the British Parliament to pay her £5,000 for the secret of her remedy for stone in the kidney. She had among her clients peers, duchesses, and bishops, and prevailed on them to testify to the value of her remedy. She intimated that she was willing to sell her secret. A powerful commission was appointed which reported that they were convinced by experiment of the utility, efficacy, and dissolving power of her remedy. And so Joanna got her £5,000. The remedy consisted of egg shells, calcined snails, soap, wild carrot seeds, and hips and haws, and that was what the country got for its £5,000. Professor Campbell discussed the methods of quacks of the present day, and said that the essence of quackery was advertising. The chief field for the quack was in persons suffering from chronic diseases. Such persons had naturally alternations of good, bad, and indifferent health, and were prone to ascribe natural improvement to the last remedy taken. It was those people who gave such grateful testimonials, and the reason for it all was just this, that the most potent of all human passions was the desire for life, health, and the relief of pain. Disease often clouded a man's judgment, the chance of relief was eagerly grasped at; besides which, as they had seen, there was always the attraction of the marvellous and the mysterious in practically everyone of them. Man never appeared to learn by experience. Quacks never showed any originality. Each generation of quacks used the same old artifices as their predecessors, and each succeeding generation of patients was just as surely duped.

The resources of the Western Infirmary, Glasgow, one of the largest voluntary hospitals in Scotland, will be shortly increased by the erection of a new building to be called The Tennent Memorial. The extension will be devoted to Ophthalmology, and is to commemorate the late Dr. Gavin Tennent who was closely connected with the work of the Western Infirmary for 39 years. By his trust disposition and settlement Dr. Tennent directed his trustees to pay over to the University of Glasgow a sum sufficient to found a Chair of Ophthalmology, and he also allocated a sum to the Western Infirmary to provide a suitable building at the Infirmary to be called the "Tennent Memorial" building in commemoration of his services to and his interest in the institution. The new building will be erected in the Infirmary grounds. It will be fully equipped for the treatment of patients suffering from affections of the eye, for the clinical instruction of medical practitioners in ophthalmic surgery pursuing a higher course of study, and for the practical and clinical instruction in diseases of the eye of a limited number of medical students attending the practice of the Infirmary. The building as planned communicates with the existing Infirmary premises, and includes a ward of 20 beds, with an operating theatre and laboratories for research in ophthalmology.

Many medical men in Canada may have already read a book entitled "The Arches of the Years" written by a graduate of Edinburgh University, Dr. Halliday Sutherland. Those who have read the book will agree that it describes in a vivid and interesting manner the outstanding experiences in the life of the author. There are most interesting chapters dealing with his experiences of the whaling industry in the northern seas, and with bull fighting in Spain. Those who knew the late Dr. George Gibson will be interested in the description given by the author of several characteristic exploits in "young George's" student days.

The Committee appointed by the Secretary of State for Scotland to review the health policy and the existing medical services of the country has now settled down to work. The statistical evidence has now been practically completed, and at its last meeting evidence was given by members of the Scottish Branch of the Society of Medical Officers of Health regarding the part that environmental factors play in relation to health. Interesting evidence was submitted on such subjects as housing, overcrowding, sanitation, water supplies, and atmospheric pollution.

R. W. CRAIG.

6 Drumsheugh Gardens, Edinburgh.

The gulf between being happy and being unhappy is one of the greatest gulfs that exist in the world. The difference is appalling; the contrast is shocking. One feels sometimes that there must be some sort of fatal insanity in human character that drives us on to hug to ourselves the very things that kill our joy, the very thoughts that murder our peace, the very strivings and competings that poison the fountain of our life—John Cowper Pawys.

Letters, Notes and Queries

Sterilization of the Unfit

To the Editor:

I am pleased to note that Dr. Bruce's article in the September *Journal* and my letter to the Editor in the October number, have provoked the able and interesting paper by Dr. E. C. Menzies. There are, however, two or three implications that Dr. Menzies has taken from my letter which I did not intend to convey— first, that I believe most cases of psychogenic insanity are due *solely* to deplorable social and economic conditions, and, secondly, that the only way to save our race is to remedy these pernicious conditions. I agree with Dr. Menzies, when he speaks *ex cathedra,* that most, if not all, psychogenic cases have a defective hereditary basis, and of course it is obvious that the idiot and the imbecile are genetically unfit. These people, if they cannot be segregated effectively so that they will not produce their kind should be sterilized. But they are replenished from the apparently normal and the undetected moron. The moron is ubiquitous and cannot be clearly distinguished in our irrational society. He often occupies a high place in our social system, and his actions often meet with approval.

As to the economic factor in the activation of the potentially insane, I do not think this factor is over-emphasized. By "economic" I do not mean only conditions of poverty; excessive wealth has an economic basis, and is just as much a disease of our society as destitution, and is in fact its corollary; so of course, the rich are not immune to mental disease. To-day, we are living in an unplanned, irrational society giving rise to unnatural conditions. This society, so-called, is dominated by an economically privileged class. The control is exercised and maintained in various ways, consciously or unconsciously, for the economic profit of the exploiter and to the economic, and what is more important, to the *mental* detriment of the exploited and so we have morons by nurture, as well as morons by nature.

Rule by a dominant class has been exercised throughout the history of mankind, and history is largely made up of the struggles of the privileged against the underprivileged. The priests were dominant in savagery and ruled the savage mind on account of his belief in magic; the feudal lord, with his serfs and the church and clergy as flunkeys, next dominated society and was forced to give up many of his privileges, only after a long and bitter fight, culminating in England in the execution of Charles I and in France in the French Revolution. Next, the industrialist, owning the means of production, dominated. His special forte was the fostering and developing of the myth of nationalism and patriotism. Of course, he inherited and cultivated any other myths that suited his purpose. Machine production outgrew national boundaries and now we have imperialism with the international finance capitalist at the top. He takes to his bosom all the myths of traditional civilization and utilizes them to the fullest extent of human credulity for his own purpose, his purpose being to maintain power, even to the extent of stultifying the human mind.

The stultifying and dwarfing of the human intellect is accomplished by means of a subservient press, a subservient radio, a motion picture industry catering to the emotions, a subservient Church with its antiquated ideas of sex and sin, and schools that are hang-overs from the Middle Ages. This is, in part, why I feel that economic domination has a stultifying effect on the human mind and is the creator of a moron by nurture. On account of the conflicts engendered by such economic control fostering the myths of traditional civilization, there are also created at least many psychoneurotics. This will include within its scope those cases said to develop from "unwise upbringing, early emotional strains, etc." Children should be protected from their parents, be they rich or poor, and emotional strains may be caused by economic suppressions. The family is also an economic unit, and with its conflicts between husband and wife, parents and children, certainly is the cause of many emotional stresses and strains.

Certainly, sterilize the *genetically* unfit, but first let us make the most of the breed we have by ridding society of the intellect-stultifying forces and myths of traditional civilization, with their accompanying economic and holy wars, for the benefit of the few and the enslavement of the many. Not until this is done can we recognize the *genetically* unfit and conscientiously either sterilize or kill him.

W. D. CORNWALL

Port Dalhousie, Ont.,
December 26, 1933.

TREATMENT OF HERPES ZOSTER.—E. Lenglet (*Bull. Soc. de Thér.*, October 12, 1932, p. 176) during the last twenty years has ordered the following treatment for cases of herpes zoster with good results. The patient is given a cachet containing 5 cg. of quinine sulphate and 7 cg. of sodium salicylate every hour, ten times daily, for five days. The earlier the treatment is adopted, the more likely it is to be successful, but it is still efficacious if first employed when the herpes is at its height. No bad effects have been observed.—Abs. in *Brit. M. J.*

Topics of Current Interest

Deaths of Physicians Published in 1932

During 1932, the deaths of 3,142 physicians of the United States were recorded in the *Journal*, as compared with 2,952 in 1931 and 2,943 in 1930. The total number published was 3,247, which includes 105 Canadians. The list includes 2 who died in Hawaii, 1 in Alaska, 3 in France, 2 each in China, Africa and Germany, and 1 each in Persia, Siam, Mexico and Egypt. The obituaries of 87 women physicians were published in 1932, as compared with 84 in 1931. The graduates of medical schools in the United States for the fiscal year ended June 30, 1932, numbered 4,936. Deducting the number of physicians whose obituaries were published, there was a net addition to the ranks of the profession for the year of 1,794, which, figured thus, is an increase of 11 over 1931.

Ages.—The average age at death of those classified as of the United States was 64.1, as compared with 63.8 for 1931. Two physicians lived to be 100 years old, and 55 others lived to be 90 or more. One was 22. Twenty-seven physicians died between the ages of 25 and 29, 44 between 30 and 34, 55 between 35 and 39, 114 between 40 and 44, 173 between 45 and 49, 248 between 50 and 54, 420 between 55 and 59, 478 between 60 and 64, 454 between 65 and 69, 419 between 70 and 74, 343 between 75 and 79, 206 between 80 and 84, and 101 between 85 and 89. January was the month of most deaths, with 282.

Accidental deaths.—One hundred and fifty-eight physicians died as the result of accidents in 1932, compared with 139 in the previous year. Automobile accidents accounted for 77 deaths, 6 more than in 1931. In 1932, deaths from falls numbered 19, the second largest number due to accidental causes. Twelve deaths were caused by drowning, 10 each by overdoses of medicine and gunshot wounds, 6 each by carbon monoxide gas, 4 each by skull fractures and burns, 3 each by airplane accidents and poisoning, and 2 each by x-ray machines, explosions and leg fractures. One was killed by a falling business sign, and remaining deaths were caused by illuminating gas and suffocation by smoke. In some cases the nature of the accident was not specified.

Suicides and homicides.—Eighty-seven physicians committed suicide in 1932, 23 more than in 1931. Shooting accounted for 36 deaths; poison for 23; incised wounds, 9; hanging and gas, 5 each; drugs, 3; jumping, 2; chloroform and stabbing, 1 each, and in the remaining cases the method was not reported. There were 8 homicides by shooting; 1 victim was beaten.

Causes.—Heart disease was again the leading cause of death in 1,101 deaths, compared with 1,065 for 1931. Some contributory causes are included in the tabulation, as they have been in former years. A report that the cause of death was "chronic nephritis and heart disease," for example, is so published in the *Journal* and is reported on the statistical charts under both diseases. Of the deaths from heart disease, endocarditis or myocarditis was specified in 332, angina pectoris in 127, and pericarditis in 2. Cerebral hemorrhage was the second most frequent cause reported, with 346 deaths; 17 additional deaths were reported as due to paralysis. Pneumonia was the third most frequent cause; lobar pneumonia was reported in 225 cases and bronchopneumonia in 59. Fourth on the list was arteriosclerosis, with 259; other diseases of the arteries caused 3 deaths. Nephritis caused 208 deaths, of which 17 were specified as acute nephritis. Of 228 deaths caused by cancer, the stomach and liver were affected in 55 cases, the intestine in 27, the prostate gland in 25, the buccal cavity in 4, the female genital organs in 1, and in 118 the part affected was not specified. Embolism and thrombosis caused 162 deaths; uræmia, 81; diabetes, 70; tuberculosis, 68;, and other diseases of the respiratory system, 8; diseases of the prostate, 47, and other diseases of the genito-urinary system, 29; influenza, 45; septicæmia, 43; senility, 42; hypertension, 37; appendicitis, 35; cirrhosis of the liver, 31, and other diseases of the liver, 8; peritonitis, 24; ulcers of the stomach, 24, and other diseases of the stomach, 7; intestinal obstruction, 23, and other diseases of the digestive system, 30. Other diseases, each of which caused some deaths, were: asthma and cholecystitis, 19; pulmonary œdema and gangrene, 17; pernicious anæmia, 14; abscesses, 12; chronic bronchitis, 12; meningitis, 12, and other diseases of the spinal cord, 1; chronic rheumatism and biliary calculi, 11; brain tumour, 10; paralysis agitans and encephalitis, 9; sarcoma, 8; typhoid, 7; shock, 6; leukæmia, hernia and diseases of the bones and organs of locomotion, 5; aneurysm, diseases of the veins, pleurisy, progressive muscular atrophy, secondary anæmia and pancreatitis, 4; syphilis, diseases of the organs of hearing, diverticulitis, mastoiditis, carbuncle, agranulocytic angina, septic sore throat, Hodgkin's disease, encephalomalacia, erysipelas and empyema, 3; typhus fever, aplastic anæmia, alcoholism, dementia paralytica, agranulocytosis, multiple sclerosis, sinusitis, œdema, Mikulicz's disease, septic cellulitis, paralytic ileus, anæmia, lymphosarcoma and intracranial hæmorrhage, 2 each. Among other unusual causes of death given for 1 case each were Addison's disease, eclampsia, myasthenia gravis, ruptured œsophageal varix, splenic anæmia, yellow fever, pancreatic cyst, sprue, and transverse myelitis following the bite of a monkey. —*J. Am. M. Assoc.*, 1933, **100:** 820.

Ethical Conditions of Scientific Method

The Bishop of Durham delivered the eighth Fison Memorial Lecture on June 15th in the Medical School of Guy's Hospital on "Ethical Conditions of Scientific Method." His purpose, he said, was rather to raise questions than to advance any specific opinions.

Dr. Henson submitted that scientific method was ethically conditioned in three respects. First, there were the moral obligations which attached to the scientific student by virtue of his manhood. Next there were the restrictions on the methods of research which were imposed by the claims of those whom they affected, and, thirdly, there were limitations on scientific research imposed by the quality of the results which they were designed to secure. They took for granted that science could not release its votaries from the ethical conditions which controlled the rest of men. When, however, they passed from the man of science to his methods of research they entered the realms of debatable casuistry. Science had largely replaced religion in popular interest. The gifts of the benevolent were now given mostly to hospitals and universities, rarely to churches. Sermons were little read; the books of our leading men of science were eagerly purchased. In succeeding to the power, would science succeed also to the temptations of religion? Did morality condition scientific method, or did the alleged interest of science override moral considerations?

This was the issue which properly underlay the obstinate controversy respecting the scientific method popularly, but inaccurately, called vivisection. The Royal Commission on Vivisection reported that they were led to the conclusion that experiments upon animals, adequately safeguarded by law faithfully administered, were morally justifiable and should not be prohibited by legislation. What was the test of adequacy in relation to safeguarding. Could it be maintained that while it was "morally justifiable" to inflict a little pain in order to gain knowledge it was not "morally justifiable" to inflict much? The infliction of pain appeared to him irrelevant to the moral issue, which properly turned on whether the reasons for which the pain was inflicted—much or little made no essential difference—were adequate, and whether such infliction did or did not violate the sufferer's inherent and indefeasible rights. Mere curiosity would be no adequate motive for inflicting pain. The formula "Knowledge for its own sake" must be applied with discrimination.

He thought the case for vivisection turned finally on the view taken of animals. When we described animals as man's poor relations we were using language which was essentially true. Organic life had for us the aspect of a single phenomenon, though infinitely graded and various. Nevertheless there was a distinction which could not be ignored. Personality could not without misuse of language be attributed to any animal but *homo sapiens*. Therefore, where man was in question the interest of science must give place to a still higher consideration.

If, indeed, the interest of science were of itself sufficient to determine the matter, the vivisection of human beings could not be resisted, for it was certain that the fundamental difference between the bodies of men and the bodies of animals largely reduced the practical value of experiments on the latter. It was the violation inflicted on personality that finally prohibited the vivisection of men. Might they argue boldly that since rights attached to persons, and since animals were not persons, animals could have no rights?

Might we ground our requirements that animals be treated humanely, not on their rights, but on man's duty to himself? He thought they might not deny that the moral conditioning of the scientific method was here indirect, through the human student's self-respect, not direct, through the animal's inherent right. Suffering was inflicted on animals for many other reasons than the interests of science, and we required a theory which should cover the entire relations of man with his non-human contemporaries.

Putting the question whether in no case might man be subjected to vivisection in the interest of science, Dr. Henson asked if there was any moral objection to the vivisection of criminals who by the law of their country had been condemned to death. In their case the issue of inherent human rights could not be raised, for these had already been cancelled. We said, very justly, that the criminal by his crimes had forfeited his rights, and we dealt with him penally on that hypothesis. Why should not his punishment take a form which was serviceable to the community? Why should he not at least be given the opportunity of making in this way some atonement for his sins against society? In the case of the criminal whose natural rights had been cancelled much might be legitimate which in the case of innocent persons like the slave and the child would be altogether inadmissible.—*The Times*, June 16, 1933.

Diphtheria Protection

Protection against diphtheria may now be given to infants and children with a single injection of toxoid, instead of three, Dr. J. N. Baker, Alabama State Health Officer, has just announced.

The new protective toxoid is the result of years of research by the late Dr. Leon C. Havens, for 12 years director of the state laboratories. The perfection of it was the last piece of scientific work done by Dr. Havens and is considered by fellow health officers a fitting monument to the man.

The new toxoid has been developed from the old toxoid, already widely used in diphtheria prevention work. Dr. Havens knew, as did other scientists, that when toxoid is treated with alum it forms a precipitate which is very slowly

soluble. This precipitated toxoid is absorbed in the body much more slowly than old-style toxoid. Dr. Havens believed that this would make it more effective, since none of it would be wasted by elimination from the body before it had time to do its job of developing immunity or resistance to diphtheria. Investigations proved that this was correct and the use of the new toxoid has been approved by the United States National Institute of Health in Washington and the state public health committee.

Dr. Baker stated at a meeting in Montgomery, Alabama, that "the finding by Dr. Havens of an immunizing agent for protection against diphtheria as potent as the present preparation will do much to revolutionize the campaign against diphtheria. Formerly it required three injections, a week apart, to secure adequate protection. With this new product one injection will immunize 95 to 98 per cent of those susceptible."

Dr. Baker said further that, with the reduction of the number of injections, a much wider use of this new protection will be possible. Medical experts have found that 75 per cent of children of pre-school age are susceptible to diphtheria and it is in this group that most of the deaths occur. "It is therefore of special importance that all children over six months of age be protected against diphtheria."

With the new toxoid requiring only one injection instead of three, the job of protecting all the school children of a city against diphtheria can be done much more quickly.—*Science News Letter*, July 29, 1933.

Reform of the Medical Curriculum in France

Important decisions were taken on March 22nd by the committee (France) charged with the revision of the medical curriculum. The process of revision has now reached a stage at which there is little left to be done but dot *i*'s and cross *t*'s. This will be the duty of the Conseil Supérieur de l'Instruction Publique and the responsible Government official who will have to devise means for bridging over the old and the new in the transitional period. The most important change is the addition of a sixth compulsory year to the curriculum. This year is to be devoted exclusively to practical studies—one winter and one summer term. Though obligatory, this year will give the student opportunities to choose between the specialties which best suit his bent: he may specialize in medicine, general or special surgery, or in obstetrics, all according to his own will. The costs of this sixth year? The authorities have realized that it would be unfair for the medical student and his relations to bear all the costs. The institutions in which he must pursue his studies will, therefore, be requested to temper the wind to the shorn lamb by lodging and feeding him more or less free of charge in return for his services. In order that the examinations may be conducted on lines conducive to impartiality, the practice of local examinations will be discouraged and the students will have to sit for their examinations at headquarters in an atmosphere of detached and anonymous impersonality. To avoid overlapping, competition, and other sources of friction and misunderstanding between the various disciplines, it is proposed that in every faculty there shall be a commission whose duty it will be every year to review and revise the working of the whole medical curriculum.—Excerpt from the *Brit. M. J.*

Abstracts from Current Literature

Medicine

Production of the Anginal Syndrome by Induced General Anoxæmia.

Induced General Anoxæmia Causing S-T Deviation in the Electrocardiogram. Rothschild, M. A. and Kissin, M., *Am. Heart J.*, 1933, 8: 729 and 745.

The August issue of the *American Heart Journal* contains two articles by Rothschild and Kissin on the relation of general anoxæmia to the anginal syndrome and to S-T deviation in the electrocardiogram. Anoxæmia was produced in a series of cases, in an endeavour to establish a better diagnosis in those cases having chest pain. Anoxæmia was induced by rebreathing in 46 cases, the cases being divided into two groups, namely, control cases and cases of angina pectoris. The control series consisted of three sub-groups, namely, normal controls, cardiac controls and pain controls. It was kept in mind that in addition to lack of oxygen other factors might affect the heart during anoxæmia, such as tachycardia, rising pulse pressure, and the increase in minute volume of the heart output. The second article describes the electrocardiographic changes in 38 persons during the production of anoxæmia. Twenty-four of these had definite angina pectoris. The conclusions reached are that the induced attacks were identical with the spontaneous attacks, and that anoxæmia is in part responsible for the pain of angina pectoris. It is believed by the authors that the response to induced anoxæmia is of value in the diagnosis of impaired coronary circulation. The electrocardiographic study did not show any qualitative finding that would serve to distinguish between those with unimpaired coronary circulation and those with impaired coronary circulation.

W. H. HATFIELD

Arteriosclerosis and Diabetes Mellitus. Lehnherr, E. R., *New Eng. J. Med.*, 1933, **208**: 1307.

The use of insulin has prolonged the life of the diabetic patient so that he lives more in the arteriosclerotic zone than ever before. Chemical analyses of 25 diabetic aortæ, of 25 non-diabetic aortæ and 6 children's aortæ were done to obtain information regarding the deposition of lipids and their subsequent calcification. The average age of the diabetic patient at the time of death was 57 years as compared with 51 years for the non-diabetic patient. In the diabetic group the causes of death were directly related to arteriosclerosis in 13 cases. There was a greater deposit of lipid, a more marked change in the lipid allocation, and a higher calcium and phosphorus content in the diabetic aortæ. Both the diabetic and the non-diabetic had increasing amounts of each lipid, increasing proportion of total lipid as cholesterol and increasing amounts of calcium and phosphorus as the age increased. The diabetic aortæ differ in the exaggeration of the process. This difference was most marked in the group from 50 to 60 years of age. In this age-group the average values for each of the lipids, the lipid allocation, and the calcium content are actually greater than the corresponding values in the non-diabetic group, 10 years older. The diabetic group with an average of 32 to 40 years of age shows no definite difference from the non-diabetic aortæ. If the age of the patient were reckoned by the amount of lipid and calcium deposited in his aorta the diabetic patient in middle life would be prematurely aged. Most of the patients were in the age period when some calcification of the aorta might be expected even in non-diabetics. It was almost impossible to find diabetics dying in early middle life. Only 2 of the 25 studied were between 30 and 45 years of age. The duration of the diabetes in the adult patients had no definite relationship with the chemical findings in the aortæ. Severe diabetes of two years' duration in a child was associated with greater lipid, but less calcium and phosphorus deposition in the aorta than was found in an aorta from a diabetic child having had uncontrolled diabetes of 8 years' duration.

LILLIAN A. CHASE

Bronchoscopy in Asthma. Prickman, L. E. and Vinson, P. P., *J. Allergy*, 1933, **4**: 286.

The authors report two cases in which severe asthma was relieved by the bronchoscopic removal of bronchial secretion when other methods of treatment had failed to bring relief. Bronchoscopy in these two cases stopped a severe and prolonged attack of asthma. The patients after bronchoscopy were restored to their usual milder and intermittent asthmatic state.

Bronchoscopic findings encountered in the asthmatic attack have been described by several writers, and include redness and swelling, rhythmic contractions of the bronchi with congestion and swelling, redness and œdema, purplish mucosa and bronchi filled with secretions, urticarial patches, spasmodic stenosis simulating cicatricial stenosis, collapse of the trachea during expiration, and catarrhal tracheobronchitis.

A group also exists having asthmatic symptoms rather than true asthma, symptoms due to the presence of such lesions as, bronchiectasis, pulmonary abscess, foreign bodies, ulcerations, scars, and primary malignancy of the tracheobronchial tree.

The writers therefore urge bronchoscopy whenever physical signs of bronchial obstruction exist; but state that it will infrequently be necessary in bronchial asthma.

T. G. HEATON

Surgery

Plasma Cell Mastitis—A Lesion Simulating Mammary Carcinoma. Adair, F. E., *Arch. Surg.*, 1933, **26**: 735.

During the course of the past eight years the author and his associates at the Memorial Hospital, New York, have observed 10 cases of this type. The first patient had a hard diffuse mammary tumour. The nipple was retracted, while the breast had the typical *peau d'orange* appearance typical of carcinoma. There was enlargement of the axillary nodes, as well as hardness. A radical amputation was performed in the belief that this was undoubted carcinoma. Pathological examination revealed no cancer. Dr. Ewing carefully examined the specimen and diagnosed the tumour as a plasma cell mastitis.

Adair purposes (a) to establish the condition in this group of cases as a distinct clinical disease among mammary lesions; (b) to place the diagnosis on a more clear cut basis; and (c) to prevent performance of grave and possible unnecessary operations.

Cancer of the breast is sometimes very difficult to diagnose. The two commonest and most difficult lesions to be differentiated from cancer are (a) a localized area of chronic mastitis, and (b) fibro-adenomas of young women. Other benign lesions simulating carcinoma are (1) traumatic fat necrosis; (2) plasma cell mastitis; (3) chronic lactation mastitis; (4) subacute inflammatory mass; (5) tuberculous mastitis; (6) gumma and syphilitic mastitis; (7) deep abscess (occasionally); (8) cyst (infrequently); (9) intracanicular fibroadenoma (rarely); (10) traumatic mastitis; and (11) benign lesions such as fibroadenoma or papillary cystadenoma lying within the areola.

There are two stages in the natural history of plasma cell mastitis: (a) the acute phase which

is usually mild and seldom seen by the physician. There is a mild local heat and tenderness and discomfort occurring spontaneously in a non-lactating breast. There is a gradual subsidence of the process leaving a residual non-tender tumour. (b) The residual phase lasting from several weeks to several months after the onset of the acute phase. There is a non-tender mass which may be localized or a diffused thickening. There may be a watery or creamy discharge from the nipple consisting of cellular detritus, mucus and desquamated degenerated living cells. Œdema may be present over the tumour or in the dependent portion of the breast, producing the *peau d'orange* appearance. There is retraction of the nipple. Enlarged, firm, axillary nodules are usually present. Signs of acute or subacute inflammation are lacking. At this stage the lesion closely simulates mammary carcinoma. There is no evidence presented that this type of mastitis is a forerunner of cancer and there is no evidence that it is not. The three outstanding pathological characteristics of this lesion are (a) marked infiltration by the plasma cell; (b) proliferation of the cells lining the ducts; (c) formation of giant cells from these proliferating lining cells.

The authors present the records of 10 cases with Dr. Ewing's exact descriptions. In 8 of these mastectomy was performed because of the difficulty of diagnosis.

G. E. LEARMONTH

Results of Surgical Treatment of Malignant Goitre. Tinker, M. B., *Arch. Surg.*, 1933, **26**: 705.

The author believes that the treatment of cancerous lesions affecting the thyroid gland may be better than certain writers would lead us to believe. The prognosis is hopeful in many of these cases, because adenocarcinoma, which is the commonest malignant growth affecting this gland, is slow in development; besides, it metastasizes late and is radiosensitive.

As in most malignant lesions permanency of results is affected by location, extent, duration of the disease and type of malignancy and the skill, experience and methods of the operating surgeon. Influencing operative results are the use of radium or röentgen rays in combination with electrosurgery, which is of the greatest importance. Growths in the isthmus or in the anterior surface of the gland do not tend to metastasize as early as those deeply located. It is often difficult to determine the duration of the disease. The longer it has existed, the greater the chance of metastasis and the involvement of surrounding tissues and difficulty of removal. Small growths especially if encapsulated have usually a favourable outcome after operation. The adenomatous type of tumour is the most favourable for treatment, while removal of the papillary type of carcinoma has given Tinker good results. Infiltrating scirrhous carcinomas and sarcomas are generally hopeless.

Surgical treatment does not give as good results as when irradiation is used as an adjunct. The best results were obtained by surgical intervention in conjunction with electrosurgery and irradiation. Gentleness of handling the tissues at operation is a requisite. A number of Tinker's patients treated by the above methods were living, ten for three years, nine for four years, eight for five years, six for six years, five for seven years, two for eleven years and one for thirteen years.

G. E. LEARMONTH

Obstetrics and Gynæcology

The Stillbirth Problem in Relation to Iodine Insufficiency. Kemp, W. N., *Bull. Vancouver Med. Ass.*, 1933, **10**: 52.

The writer questions the pre-eminence of syphilis and cerebral hæmorrhage as causative factors in stillbirths. Abbott and Ball, in 100 autopsies of stillborn fetuses and babies dying soon after birth, found that 41 per cent had anatomical evidence of disease in the thyroid gland, and deduced that iodine was necessary for the mother during pregnancy if the incidence of goitre was to be lowered. The death of the fetuses and newborn infants might also be argued to be directly related to iodine insufficiency and resulting thyroid dysfunction. In the valley of the Lillooet River, near Vancouver, it was found that without the prenatal feeding of iodine to pregnant stock during winter months 80 to 90 per cent of the calves and foals died at birth. Five drops weekly of the tincture of iodine given to pregnant mares and cows in the last three months of gestation absolutely prevented this severe economic loss.

In the 19,730 deliveries in Vancouver from 1925 to 1929 inclusive there were 330 idiopathic stillbirths. Analysis showed that the incidence of idiopathic stillbirths from mothers who were not treated with prenatal iodine was six and one-third times more common than from those who were so treated. Again in 4,813 deliveries occurring in the Vancouver General Hospital from 1930 to 1932 inclusive there were 50 idiopathic stillbirths. There were 741 deliveries following the prenatal exhibition of iodine, and in this group there were no cases of idiopathic stillbirth, while among 4,073 deliveries in which no prenatal iodine was prescribed 50 idiopathic stillbirths occurred. Again, idiopathic stillbirths are very rare among the sea-coast Indians whose diet consists almost entirely of iodine-rich sea food.

Kemp argues that the occurrence of idiopathic stillbirths is evidence of a hitherto unrecognized biochemical strain thrown upon the maternal and fetal organism by an in-

sufficiency of ingested iodine during pregnancy. A diet containing adequate sea-food is suggested as the most natural and economical method of providing sufficient available iodine during pregnancy.

ROSS MITCHELL

The Late Effects of the Toxæmias of Pregnancy. Evans, M. D., *J. Obst. & Gyn. Brit. Emp.*, 1933, **40**: 1024.

In the Maternity Department of the Cardiff Royal Infirmary 229 patients were treated for toxæmia of pregnancy during the years 1928 to 1931. Seventy-six of these were followed after delivery from 4 months to 4 years. After-effects of the toxæmia were found in 66 per cent of these patients; 28 per cent showed chronic nephritis, while 23 per cent more had simple albuminuria.

The prognosis is influenced: (1) by age; primiparæ suffer less than multiparæ; the older the albuminuric patient, the greater the chances for development of chronic nephritis; (2) by the antepartum duration of the albuminuria; in the cases reported the development of chronic nephritis was increased markedly if the albuminuria persisted more than 14 to 21 days; hence labour should be induced if in spite of rest in bed for 2 weeks albumin still continues; the presence of albumin in the urine on discharge from the hospital also influences the prognosis adversely; (3) by headaches; these were a persistent symptom in the cases which developed a chronic kidney lesion, whereas the degree of œdema or the presence or absence of casts seemed to be little index; (4) by the height of the blood pressure; a systolic blood pressure of 170 mm. which persists, is dangerous; in the patients developing chronic nephritis the fall of blood pressure after delivery was less marked.

ELEANOR PERCIVAL

Oto-Rhino-Laryngology

The Effect of Radical Antral Surgery on Bronchitic Asthma. Warner, W. P. and McGregor, G., *J. Laryngol. & Otol.*, 1933, **48**: 595.

Chronic disease of the accessory nasal sinuses is thought by many to be a very important factor in the production of chronic bronchitis and bronchitic asthma. The work reported in this paper is an attempt to evaluate the effect of radical antral surgery (including the removal of the thickened mucoperiosteum and the establishment of free drainage) on the bronchitic asthma or chronic bronchitis present.

Thirty-one cases of bronchitic asthma were treated by radical antral operation, which included the removal of the thickened mucoperiosteum. They were followed closely for from six months to two and a half years, and in two cases only were the results decidedly favourable and permanent to date. All cases had a period of freedom from asthma following the operation, but relapsed later. The longest period of freedom from symptoms was twenty-seven months, the shortest two weeks, and the average of all cases four months. These results are so poor that radical antral surgery undertaken for bronchitic asthma should be recommended with a great deal of hesitation. There were no peculiarities in those cases apparently benefited for a long time which would enable one to decide for certain on which cases to operate. The cases apparently benefited had had asthma for a relatively short time and presented a markedly thickened mucoperiosteum. From the above observations it would seem that results of the treatment of asthma by operative procedures on the nose should not be reported until the patients have been observed for a long period of time following the operation. Owing to the temporary relief from asthma for at least two weeks following the operation it was performed as a life-saving measure in one case.

Five cases of chronic bronchitis were treated by radical removal of the thickened mucoperiosteum, and were observed for a period of two years, but no benefit accrued from the operation.

In all these cases the local effect of the operation was good, as it reduced the frequency of head-colds and in no case were any ill effects observed as a result.

GUY H. FISK

Therapeutics

Autolysed Yeast Products in the Treatment of Anæmia. Davidson, L. S. P., *Brit. M. J.*, 1933, **2**: 481.

The therapeutic effect of yeast products in different types of anæmia is briefly reviewed. In the hypochromic anæmias (the nutritional anæmias of infants or the iron-deficiency anæmia of adults) yeast products are of little or no value, though they may at times advantageously supplement iron in infantile cases. Autolysed yeast (Marmite) has, however, been found to be most effective in the treatment of tropical hyperchromic macrocytic anæmia, as in cases of sprue. Its effect on 16 cases of true Addisonian anæmia is here reported by the author, who compares his results with those of other workers. Seven of the reported cases showed no response to Marmite, but brisk response to the anti-anæmic factor in liver and hog's stomach. In 4 more cases no response to Marmite was obtained but the response to other therapy was also slow. In two cases all forms of therapy were unsatisfactory; in the final two cases good results with Marmite were obtained, and one of these patients

had maintained a normal blood level on very small doses for more than a year. In some of the cases an alcoholic extract of Marmite was used. It is certain, then, that Marmite does contain an anti-anæmic factor, but the concentration is small and it is obviously not justifiable to use autolysed yeast products in their present state as substitutes for liver or hog's stomach therapy.

The nature of the hæmopoietic principle in Marmite is discussed. Castle's hypothesis regarding the etiology of pernicious anæmia is provisionally accepted — namely, that megaloblastic blood formation is due to the lack of a specific anti-anæmic factor (contained in liver), normally formed by the interaction of a stomach ferment (the intrinsic factor) upon some constituent of the protein of the food (the extrinsic factor). There is ample evidence that the hæmopoietic factor in liver, liver extract and Marmite is not vitamin B_2, as Castle first postulated. Since dried yeast or a watery extract is therapeutically inactive, it follows that the active principle is manufactured during autolysis and is probably a polypeptide. If the active principle of Marmite is the same substance as the anti-anæmic factor of liver, it must be assumed, on Castle's hypothesis, that it is produced by the action of yeast enzyme (intrinsic factor) on yeast protein (extrinsic factor) during autolysis. Therapeutic failures, in that case, would be explained by insufficient dosage. But if the active principle in autolysed yeast is merely concentrated extrinsic factor, variation in response to treatment would depend on the presence or absence in the patient's stomach of any of the intrinsic factor. Castle has already demonstrated that this intrinsic factor may at one time be present and at another time absent from the stomach. A partial return of the secretion of this factor by the stomach supplies the most likely explanation of natural remissions and the maintenance of normal blood levels without treatment for months or years. It would seem that the factor which determines whether a response to Marmite therapy will occur depends essentially on the ability of the stomach to secrete the intrinsic factor. It may eventually emerge that autolysed yeast products contain not only a large amount of concentrated extrinsic factor but also a smaller amount of the specific anti-anæmic factor (contained in liver) as well.

Marmite, the author points out, while pleasant in small doses, is definitely nauseating and irritating to the gastro-intestinal tract in large doses (say 180 grams per day). Hence large dosage is contraindicated except for short periods of observation, for research. He notes that no improvement has been found to occur in cases of subacute combined degeneration of the cord treated with Marmite.

W. FORD CONNELL

The Effect of Yeast and Wheat Embryo in Anæmias—1. Marmite, Yestamin and Bemax in Megalocytic and Nutritional Hypochromic Anæmias. Ungley, C. C., *Quart. J. Med.*, 1933, **2**: 381.

The author has investigated 8 cases of hypochromic anæmia, 2 cases of atypical pernicious anæmia, without achlorhydria, and 10 cases of typical pernicious anæmias—to determine the value of various yeast preparations in producing blood regeneration, the criteria being the reticulocyte response under treatment with large dosages of the various substances used. These were Bemax, which is detoxicated wheat germ, Yestamin, dried brewer's yeast, and Marmite—an extract of autolysed yeast. A 65 per cent alcoholic extract of Marmite was also tested.

It was found that yeast preparations alone, even in massive doses, did not influence blood regeneration in idiopathic hypochromic anæmias. The author is still investigating the value of yeast as a supplement to iron therapy, especially in the nutritional hypochromic anæmias of pregnancy, where Parson's work suggests that it may be of value. The 2 cases of atypical pernicious anæmia and 7 of the classical cases showed a reticulocyte response under yeast therapy; 3 classical cases failed to respond. In no case was the response maximal, or as great as is obtained with Marmite in certain megalocytic anæmias without achlorhydria which are believed to be due to other than defective gastric secretion of the intrinsic factor, *i.e.*, sprue and the anæmia of idiopathic steatorrhœa.

Therapeutically, the variable and submaximal results obtained indicate that none of these preparations is a satisfactory substitute for liver in the relapse stage of pernicious anæmia. The results obtained to date with the 65 per cent alcoholic extract of Marmite are promising however, and suggest that an inexpensive product suitable for the treatment of pernicious anæmia may yet be obtained from yeast.

The possible reasons for the potency of yeast in pernicious anæmia are discussed.

W. FORD CONNELL

Radiology and Physical Therapy

Radiological Study of Intrathoracic Calcifications of Infancy. Pehu, M., *Rév. de Méd.*, 1932, **49**: 432.

Intrathoracic calcifications are described as pathological processes by which calcium salts are deposited in the pulmonary tissue, the mediastinal lymph nodes, or the pleura, and in children this is considered pathognomonic of tuberculous processes. According to Lambert there are marked differences between such lesions in adults and children.

The material studied was taken from the pædiatrics service of the Debrousse Hospital in Lyons which treats children from birth to 15

years. Examinations were made of 1338 roentgenograms taken over a period of 8 years (1924 to 1931). There is no clinical picture for intrathoracic calcification, and so it is usually found in the process of an examination for some other cause. However, the author points out that a search should be made for it in children who have had a pleurisy, a peritonitis, or a phlyctenular conjunctivitis. Worringer, of Strasbourg, has pointed out the relationship between the presence of calcium in the lung and ocular manifestations of tuberculous infection. In a positive roentgenogram a calcified area appears intensely black, approaching in density that of the heart and vertebræ and considerably surpassing that of the ribs. The density may vary with technique, but the shape is usually typical. There are two principal sites in which calcified areas may appear; first, in the pulmonary tissue, and second, in the hilum. Only rarely in children is calcium found in the pleura. Pulmonary calcifications usually lie at some distance from the hilum and are most common on the right side. They are often single and are usually found in the lower lobe. Occasionally many nodules are found scattered through large areas of the lungs; these are usually of the same density and would seem to be of contemporary origin. Only rarely are apical shadows found, and when present it is doubtful if they represent a primary infection. Very rarely, the lung is found to be thickly scattered with very dense small nodules of uniform size and shape, which are considered to be evidence of a previous miliary tuberculosis which has healed by calcification.

Hilar calcifications are due to the deposition of calcium in the hilar lymph nodes. The nodes lying about the trachea may also be involved as well as the smaller lymph follicles lying in the interlobar fissures. One or more nodes may be involved, and the condition may be unilateral or bilateral.

Opinions differ as to the method of formation of these calcified lesions and serial films on a large number of cases will be necessary to decide the question. Diagnosis is usually easy. When calcium appears in the body its shadow is dense, the contour definite, and the image is likely to be speckled or mottled where dense fully calcified areas are lying in less densely calcified areas. All too frequently in general practice calcification is diagnosed without sufficient proof. The structures most frequently mistaken for calcified areas are; first, inflammatory hyperplastic lymph nodes, and secondly, shadows cast by blood vessels. The inflammatory nodes are very difficult to interpret, but the problem can usually be solved by watchful waiting followed by a second roentgenogram some months later. The vascular shadows are the most common source of error. They are distinguished by their great regularity and the fact that they diminish in size directly with their distance from the hilum. Further, a plate taken at a different angle will show altered density which is not the case with shadows cast by calcified areas.

The author concludes that shadows of intrathoracic calcification in children can be demonstrated if they are present, and that this knowledge is of great value, for these lesions prove the presence of a tuberculous infection, either glandular or pulmonary. Usually the calcification is an indication of a previous acute invasive stage of the process, but its presence, on the other hand, is not any proof that the process is entirely healed. It only proves that there has been a local deposition of calcium, whereas there may be quite active disease in some other part of the body.

LALL G. MONTGOMERY

Anæsthesia

The Use of Chloroform Capsules in Childbirth.
Rivett, L. C., *Medical Officer,* 1933, **49**: 97.

For some time the Queen Charlotte and the Middlesex Hospitals have been experimenting with a new method of administering chloroform in childbirth. It is administered in small doses in crushable capsules (20 minims in a capsule similar to that used for amyl nitrite—Brisettes). The National Birthday Trust Fund sent out forms to various hospitals and physicians asking for the results of their experiments. Two thousand reports, representing 42 hospitals and 56 doctors, were returned. Not one maternal death was reported and very few cases of stillbirth. At the above two hospitals the capsules have been given to 4,000 patients with no maternal or infant deaths. Midwives are being instructed in the administration of chloroform by the capsule method at these two institutions.

According to the reports returned, over 90 per cent of the patients obtained relief from pain; in over 50 per cent the patient felt great relief; about 5 per cent of the patients became excited and refused the chloroform. As regards the effect on the character of the labour, in over 60 per cent of cases it was not altered at all, and in 15 per cent the use of the capsules assisted the progress of labour by abolishing the actual pain and allowing the natural powers to act unhindered by restraining efforts of the patient. It must be remembered that the capsules are only for alleviating pain in the second stage of labour, and not for a modified method of producing chloroform anæsthesia for the purpose of applying forceps or inserting sutures. In conclusion it may be said that this appears to be a completely safe and foolproof method of relieving the intense pain of childbirth, but it

should always be given in the presence of a physician or by someone who has received special instruction in its use.

ARTHUR WILKINSON

Hygiene and Public Health

On the Normal Absorption and Excretion of Lead. (1) Lead Absorption and Excretion in Primitive Life. (2) Lead Absorption and Lead Excretion in Modern American Life. (3) The Sources of Normal Lead Absorption. (4) Lead Absorption and Excretion in Infants and Children. Kehoe, R. A., Thamann, F. and Cholak, J., *J. Indust. Hygiene,* 1933, **15**: 257.

Kehoe *et al.* have for a number of years held that lead is constantly found in human excretions if sufficiently delicate tests are used.

In the first of this series of studies a report is made of some investigations of Mexicans living in a relatively primitive area where industrial exposure to lead was out of the question and where the contamination of food or air with lead would be minimal. The only possible opportunity for the introduction of lead into the food was found in the earthenware utensils glazed with lead. Actually, however, in an examination of various foods eaten by these Mexicans minute quantities of lead were found of the order of 0.01 to 0.1 milligrams per kilogram of raw food, and slightly higher values in certain prepared food. In the urine of these people an average of 0.01 per litre of lead was found and in the fæces 0.03 per gram of ash.

The second article deals with a study of 4 normal persons with no unusual exposure to lead. The food of these four young men was analyzed daily for four months and also their urine and fæces. The average amount of lead ingested daily in the food was found to be about 0.17 milligrams. The excretion of lead in the urine was from 0.017 to 0.026 milligrams per litre, and in the fæces 0.15 to 0.23 milligrams per day. After observing these subjects for some time known amounts of lead were fed to them. The amount of lead excreted rose rapidly, but soon fell to the normal level established before the lead was administered, indicating to the authors that an intake of an abnormal amount of lead does not result in an appreciable retention. To check these analyses, random samples of the urine of 88 persons were examined and found to average 0.07 milligrams of lead per litre. None of these persons were exposed to lead.

The third article deals with possible sources of lead for individuals not exposed industrially. In some localities lead is found in fairly large quantities in water, but ordinarily this is not an important factor. A large number of food stuffs were examined and a number were found to contain appreciable quantities of lead. The spraying of fruit and vegetables with insecticides is suggested as a probable source.

In the fourth article a group of American children without any evidence of lead intoxication was examined. These children were found to be excreting from 0.02 to 0.18 milligrams per litre of urine, and about 0.08 milligrams per gram of ash in the fæces.

All these studies indicate a universal absorption and excretion of lead. The analytical method used is given in detail, since the whole value of these studies rests on the accuracy of the method. Dr. L. T. Fairhall was invited to comment on the method. Some doubt of the method is expressed by him.

It is clear, however, if these analyses are accurate, that the mere discovery of lead in the excretions of an individual is not an absolute indication of abnormal absorption.

FRANK G. PEDLEY

Lead Absorption and Excretion in Relation to the Diagnosis of Lead Poisoning. Kehoe, R. A., Thamann, F. and Cholak, J., *J. Indust. Hygiene,* 1933, **15**: 320.

In a detailed study of 2 persons exposed to lead in their occupation the situation with respect to the excretion of lead in the urine and fæces after exposure to abnormal absorption was studied day by day over a long period of time. When exposure to lead ceases a considerable amount of lead is probably excreted unabsorbed in the fæces. This period is frequently missed by the physician, since the patient may not consult him until he has been away from his occupation some days. After this initial very high excretion, the person continues to excrete relatively large quantities of lead, but at a rapidly diminishing rate. The rate of excretion, if plotted as a curve, shows during the first 6 or 7 weeks a rapid drop and thereafter a gradual flattening out to what the authors believe to be a normal excretory rate.

The significance of these findings must be considered in the light of previous studies of these authors which showed that normal people without known lead exposure excrete constantly small quantities of lead. The inference is, that if the excretion of lead by persons suffering from lead poisoning falls to the level of normal individuals, that no undue retention of lead has occurred. If this deduction is correct, it fails to lend support to the view held by some that episodes of lead poisoning may occur after apparent cure and with no further exposure. Additional support is given to the thesis by the analysis of the bodies of persons who have died of lead-poisoning, of persons who have been exposed to lead but have died of other causes, and of persons dead without known exposure to lead.

The analysis of post-mortem tissues show that the preponderance of lead occurs in the

skeletal system. One such analysis of a man who had suffered heavy lead-dust exposure 8 months before death showed a lead distribution after death not very different from that which the authors consider normal. Another analysis of the body of a person who had been exposed to a moderate amount of lead for 20 years, but had been away from exposure for 2 years prior to death, showed a normal picture.

FRANK G. PEDLEY

Pathology and Experimental Medicine

Notes on the Nature of the Splenic Characters in Banti's Splenohepatic Anæmia and a method for Scoring them. Fox, H., *Am. J. M. Sc.*, 1933, **186**: 248.

Fox has studied the microanatomy of the spleen in 23 cases of Banti's disease. Thirteen of the spleens were from fresh cases, accepted clinically and later studied histologically; the remaining 10 were examined from sections alone.

The features noted in the gross specimens were as follows. The organ weighed from 600 to 1600 grams. Its shape was well preserved. Patches of local chronic perisplenitis were commonly found. The cross section was usually dark brown, firm, rather homogeneous in appearance, with a perceptible increase in delicate red-gray strands, indicating a multiplicity of fine trabeculæ. The Malpighian bodies were not prominent. In one case endophlebitis and obliterative endarteritis between liver and spleen were found, and in one case a sclerosing and calcifying phlebitis. Histologically, there was no characteristic capsular change. The Malpighian follicles were reduced in number and size. Fibrosis of the follicular centres, of the pulp, and of the trabecular lines was a constant finding. The veins of the trabeculæ were usually distended, often showing degenerative changes, and in 2 cases calcification. An increase in the moderate-sized reticuloendothelial cell or endotheliocyte was usual, especially when the organ was removed about a year after the inception of the disease. Pigment was only slightly increased. Its quantity varied directly with the amount of blood present.

The liver was found changed clinically in 10 of 16 cases, and at operation or autopsy in 7 of 14 cases. No difference was noted in the histological appearance of the spleen between the cases with and without proved hepatic damage. The author therefore feels that there is little justification for a sharp separation of splenic anæmia from Banti's disease. He therefore suggests the term "Banti's splenohepatic anæmia," to include cases of both splenic anæmia and Banti's disease. He further points out that the histology of the spleen in this disease is quite different from that in primary hepatic cirrhosis, where marked congestion, pigmentation, prominent lymphoid structures, and limited fibrosis are features. It also differs in important respects from the enlarged spleen of purpura hæmorrhagica, anæmias, malaria, syphilis, tuberculosis and Hodgkin's disease.

He finally summarizes the characters of the spleen in Banti's disease as follows: "Diminution in the size and relative number of the follicles per square area; an increase of fibrosis around the follicles, along the sinuses and in the neighbourhood of the trabeculæ; a hyaline accumulation in the centre of follicles; a prominence, but no great exaggeration, of large mononuclears and a slight increase of pigment."

E. S. MILLS

Antigenic Differences between Short and Giant Ragweed Pollen. Cromwell, H. W. and Moore, Marjorie B., *J. Allergy*, 1933, **4**: 347.

A considerable literature has grown up concerning the identity or differences between the antigens of the pollens of the various grasses and of the ragweeds respectively. The authors point out the lack of agreement in the literature, some writers claiming a very close similarity or identity between the antigens in each of the above groups, while others emphasize that differences exist and must be considered in treatment.

In their present experiments, the authors sensitized one group of rabbits by repeated intraperitoneal injections of whole pollen suspensions of giant ragweed and other rabbits with whole pollen suspensions of short ragweed. After an interval skin tests were made in both groups with serial dilutions of extracts of the pollens of giant and of short ragweed. After an interval, skin tests were made in both groups with serial dilutions of extracts of the pollens of both short and giant ragweed. Their results show "a very definite specificity in the skin reactions of the rabbits to the pollen extracts." A similar specificity was demonstrated in the various rabbits by means of a precipitin reaction between the serum of the rabbits and the two pollen extracts.

The authors' comment on these results is in part as follows: "While cross reactions were obtained demonstrating the group-relationship of the two species, yet their difference is obvious in the more pronounced reactions to the homologous pollen extracts in both the rabbit skin tests and the precipitin tests." "The possibility is obvious however, that antigenic differences between the two (pollens) demonstrable in artificial sensitization of lower animals, may on occasion be revealed in the natural sensitization of human beings." Clinically cases do occur in which individuals are sensitive to one of the ragweeds only and negative on skin testing with the other.

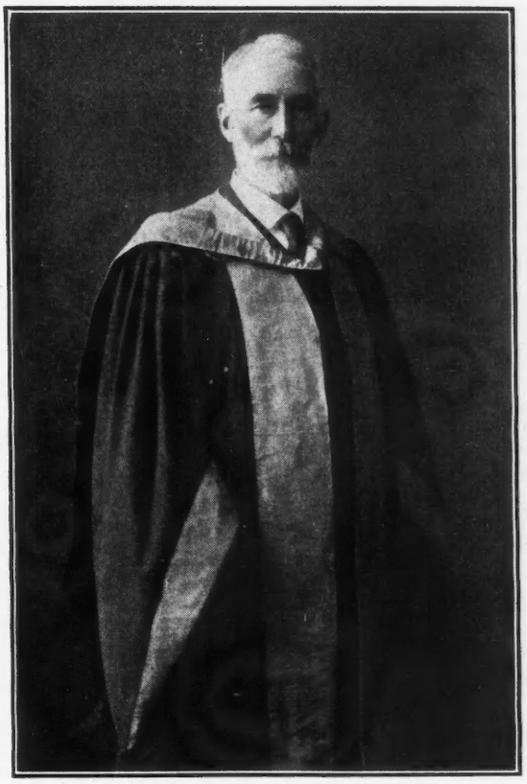
T. G. HEATON

Obituaries

John Stewart, C.B.E., M.B., Ch.B.(Edin.), LL.D.,(McGill, Edin., Dal.), F.R.C.S.(Hon. Edin.)

In the passing of Dr. Stewart Nova Scotia loses an illustrious son and the medical profession of Canada a widely known and much beloved member. After a long period of ill health he passed away at his home in Halifax, on December 26, 1933, at the advanced age of eighty-five.

Dr. Stewart, son of a Presbyterian clergyman, Rev. Murdoch Stewart, was born at St. George's Channel, Cape Breton, on July 3, 1848. He received his education at home, at the country school, and at the Model School and Provincial Normal School, Truro. After a year of teaching in Sydney he left for Scotland where for a period of three years he was engaged in farming near Blairgowrie. He attended one year in Arts at Edinburgh University (1871-72). Returning to Nova Scotia, he began the study of medicine in the newly organized Medical School at Halifax, later completing his course in Edinburgh. He graduated from Edinburgh University in 1877 with honours. It was during this period that he became associated with Professor Joseph Lister (as he was then). In 1875 he was Lister's dresser; in 1876-77, his clinical clerk. When Lister removed to London to occupy the Chair of Surgery at King's College Hospital he brought four of his students, Sir Watson Cheyne and Dr. Stewart as house surgeons, Mr. W. H. Dobie and Mr. James Altham as dressers. It is well known that Lister gave Dr. Stewart much encouragement to remain in London, but love of his native land urged him to return to Canada. In 1879 he settled in Pictou, where he engaged in general practice for fifteen years. Coming fresh from the clinic of his famous chief he became a pioneer in introducing Listerian methods in this country. At a time when there were no nurses and no hospitals Dr. Stewart carried on his work in a manner which is now of historical interest. The operating room was sometimes a kitchen quickly converted into a workshop by the doctor himself. Frequently the only light was a kerosene lamp. Here under conditions far removed from present-day facilities results were obtained which compare favourably with those of to-day. Dr. Stewart's ability was soon recognized by his colleagues and his services were sought far and wide. While in Pictou he took an active interest in athletics, especially football and lacrosse. In 1894 he removed to Halifax, where for the remainder of his life he practised as an operating consultant surgeon and exercised a profound and beneficial influence on his profession. He was President of the Provincial Medical Board in 1906-1916; President of the Canadian Medical Association in 1905; twice President of the Medical Society of Nova Scotia. For many years he was a member of the Dominion Medical Council and its President in 1925. He was Professor of Surgery at Dalhousie for many years; Dean of the Medical Faculty from 1919 to 1932; and a valued member of the Senate. The Lister Oration was brought into effect largely through his efforts, and in 1924 he was chosen by his colleagues as the first orator, to be succeeded by such distinguished men as Sir Charles Sherrington (1927), Lord Moynihan (1930) and Dr. Robert Muir (1933). Other honours conferred on Dr. Stewart were LL.D. McGill, 1910; Edin., 1913; Dal., 1919. During the Lister celebration in Edinburgh in 1927 Edinburgh honoured him again by conferring the honorary degree of F.R.C.S.



Dr. John Stewart.

Of special interest in the career of Dr. Stewart is his military record. In early life he was a Captain in the 3rd Richmond Regiment, and later he was a member of the Pictou County Artillery. He was no novice in military matters when at the age of sixty-seven he enlisted for overseas service, taking command of No. 7 Stationary Hospital. This unit left Canada in 1916, was stationed for six months at Shorncliffe, England, and later functioned at Harfleur, Arques and Etaples. At all times he proved his efficiency as a Commanding Officer. It was always a matter of pride to his friends to note the high esteem in which he was held by all ranks. Many distinguished consultants visited the hospital from time to time and he was able to renew acquaintance with many old friends. It was not unusual to hear him addressed by his old college friends as "John".

Dr. Stewart never looked for personal honour. On one occasion he was recalled to England to take a responsible consultant post, but he raised such objections that he was permitted to return to his unit in France. He remained in France until March, 1918, when he was appointed consulting surgeon for a large British division. His overseas service reached its climax when in 1919 he was decorated by His Majesty the King, receiving the C.B.E. Among Dr. Stewart's most cherished memories was the visit of the King and the Prince of Wales to his hospital in 1917, on his sixty-ninth birthday.

Of his private life it would be difficult to express anything approaching a proper appreciation of the man. It can be tersely expressed by a remark which was frequently heard— "There is only one John Stewart." He took a deep interest in religion and, while a staunch Presbyterian, he was broad in his outlook and had his admiring friends in all denominations. He had many hobbies, and was an ardent lover of nature. Perhaps his pet hobby was photography, and his camera was a constant companion. Walking was a favourite method of recreation, and his story of his walk from London to Edinburgh was a story worth listening to. As a correspondent he had few equals. He kept up a correspondence with his friends until the last. On his first trip to England, in 1868, he sailed in a sailing ship

commanded by Captain Waters, of Pictou. This veteran of the seas died in 1918 but for fifty years he had never failed to receive a card from Dr. Stewart on the anniversary of that trip. From 1919 until his death he was consultant surgeon to Camp Hill Military Hospital.

Dr. Stewart was unmarried. He is survived by one brother and five sisters, out of a family of ten. After a service in St. David's Church his remains were conveyed to the station on a gun carriage, preceded by members of his military unit, and followed by numerous friends in the city. He was buried in Pictou beside his parents.

APPRECIATIONS

Sir StClair Thomson, M.D., F.R.C.S., London, house-surgeon to Lister in 1883, writes to us as follows:—

The small band of Lister's immediate disciples is rapidly disappearing. We had lately to record the death of Hamilton Russell, of Melbourne, one of the later of Lister's house-surgeons, who had carried the evangel of modern surgery to Australasia. Now we have to report the death of a pupil who was one of the most devoted of the apostles of the great master in North America and who, from the depth of his affection, was able to record for both continents some of the most sincere pen-pictures of his beloved teacher. Dr. John Stewart had also the advantage of being one of the small band who, having accompanied Lister from Edinburgh to London, was with him at the most marked period of the *Sturm und Drang* which followed that migration. This was in 1887. Lister, when accepting the invitation to occupy the chair of Clinical Surgery in King's College Hospital, stipulated that he should be allowed to bring with him, as assistants, those who had already been trained in his methods. The late Sir W. Watson Cheyne came as his house-surgeon and John Stewart as senior clerk. They were, each in his way, typical specimens of two races which are found in Scotland north of the Grampians. Watson Cheyne with his red hair and honey-coloured beard showed the Scandinavian origin of the inhabitants of Shetland, just as his life-long love of the sea suggested his Viking ancestry. Stewart was a splendid specimen of the black-haired Highlander: tall, stalwart, handsome, dignified, gracious with courtly manners and soft, clear speech. He also was bearded, and in one of the many reminiscences he has left of those days he mentions that what he and Cheyne felt most on their arrival at King's was the contrast between their hairy visages and the smooth chins of their English colleagues at the Hospital. But this, he at once adds, was the only embarrassment he felt, for his fellow residents were most generous in welcoming and making smooth the arrival of these Scotch invaders. What he did feel deeply, with astonishment and a naturally loyal resentment, was what he described as the "colossal apathy," the "monstrous inertia to the force of new ideas," with which the evangel of Listerism was received in London. After the excitement of the first novelty had worn off the Edinburgh invaders were, so far as their message of healing was concerned, left severely alone. The surgeons of the metropolis did not even trouble to come to Kings to listen to the expounding of the principles of antiseptic surgery and study the technique founded on them. Students neglected the Listerian wards, as they were not taught the tips to get them through "the College and Hall" (*i.e.*, the College of Surgeons and Apothecaries' Hall, the two usual diplomas of those days). After the crowded class of some three to four hundred students who flocked to his clinical lectures in Edinburgh, Lister felt this neglect in London as "a humiliating experience."

John Stewart succeeded Cheyne as house-surgeon to Lister's wards in 1878. I was then a first-year student, and naturally, as such, had but a slight and distant acquaintance with him. But I remember the courtly kindness with which he dressed (in a cloud of carbolic "spray") my hands, which had been wounded when I got a toss over the handle-bars while riding a high, iron-rimmed, bicycle of the "penny-farthing" type.

It was many years before we met again. It must have been in 1916 or 1917, on going in to a Canadian hospital at Havre (I believe it was "No. 7 stationary"), I unexpectedly recognized in command the same handsome Highlander, though the black beard had become silvery. He remained in France until the end of the War. From that time we had frequent communications and it was a delight to see him at the meeting of the British Medical Association in Edinburgh in 1927, and, although for the last time, at Winnipeg in 1930.

It is interesting to anyone to read Stewart's reminiscences of his great master. It was always an encouragement to note how this devoted and affectionate pupil had been strengthened and guided in his life work by the inspiration which can be imbibed from a great teacher. What he had learned, in Edinburgh and London, he freely and gladly passed on to others. Canada has been fortunate in having such a worthy son to illustrate, by his life and writings, the influence exerted by one of the great masters on a devoted pupil.

George H. Murphy, M.D., F.R.C.S., Halifax, N.S., writes:—

There are many in these Maritime Provinces whose personal contacts with Dr. John Stewart were more intimate than mine. Perhaps one of them should write this appreciation. He might be able to make his words glow with more of that warmth which memory and affection are wont to surround, as with a halo, a beloved friend and noble physician. I believe the Editor of the *Journal* had in mind that I should endeavour to express, in some small way, necessarily, the thoughts and emotions of our profession in the Maritimes at the passing of one who during his whole life embodied medicine's best ideals, walked on a plane of professional rectitude which inspired all, made close followers of many, and moved even those that could not reach his height to a better conception of the duties and responsibilities involved in the practice of our art.

There was never a moment in his long professional life that Dr. John Stewart did not possess the confidence of every doctor in these provinces. He was a staunch believer in medical societies, and along through the years there were few meetings of the Nova Scotia and Canadian Medical Societies that he did not attend. The annual meeting of the Medical Society of Nova Scotia never seemed just right without him, and this feeling grew with the years, so that his entrance to our medical assemblies was the occasion for an ovation. Many times I observed the effect of his presence on the general psychology of our meetings. The intellectual tone of the assemblage seemed to improve under the stimulus of this modest, gray-haired chieftain who thought no evil, and sought not even the smallest prominence from a fraternity of doctors that would gladly offer him a crown. The hesitating young practitioner from the remote district, who, without many of the modern scientific guides, was wrestling bravely and well with the problems of general practice, had a special appeal for him, and his clear-cut judgments and his kindly encouragements went with the practitioner back to the countryside where in the currency of deeds they lived and wrought again. In discussions, never aggressive, never rashly dogmatic; but a quiet strength in his advocacy was easily sensed, and one felt that, whether right or wrong, there was no lack of effort or sincerity in his desire to arrive at the truth. And this intellectual honesty lived and moved in every department of his activity.

A son of the manse, he was born beside the Bras d'Or and passed his childhood and boyhood amid the fairy environment of that delightful locality. Here, where land and sea mingle in magic tapestry, and where sentinel mountains lean back against the sky, were woven into his being that artistic temperament and love of natural beauty which continued a distinc-

tive characteristic throughout his life. He was fortunate, too, in his education. His father, the Reverend Murdoch Stewart, was an honour man in Classics at Aberdeen, and the manse became an educational centre for his own family and other ambitious ones in the parish. College courses leading to the Bachelor's degree were not available to the youthful student, but we who knew him in later years could easily discern in his spoken and written word a broad culture founded on his early classical training. In this wonderful home, too, were woven into his education those golden threads of moral responsibility and high ideals of religion which, carried into his professional life, made conscience and virtue close companions of surgical science.

No one could have been more fortunate in his decision to study medicine. Some discerning fairy—there were lots of them around the Bras d'Or—may have put it into his head after observing the boy in his country rambles studying the flora of the neighbourhood and developing his powers of observation. Two years at Dalhousie, then Edinburgh, then Professor Joseph Lister, and his professional career was begun.

The story of John Stewart's return to Nova Scotia and his practice of surgery here is well known and need not be retold. His heart was in this province, his family was here, and he came back fresh from his assistantship to Lister at King's College Hospital, London, the best qualified man on this side of the Atlantic to spread the doctrine and demonstrate the practice of the new surgery. The biggest centre in our country was his logical place, but he chose the comparatively small field of Pictou, where he remained a few years, when he removed to halifax. Some of his best friends have criticized his "burying himself away" during these all important years of the surgical renaissance. By itself, the criticism is not without warrant; the only thing is that they were thinking about another type of man than John Stewart. What his well trained brain and hand found to do he would do with all his might; and, if it were not "good business", it was at least natural that he should bring the glad tidings of a great hope and a new life-saving practice first to the people whom he knew and understood and loved, and who loved him in return.

Of John Stewart's influence on the medical profession in these provinces much might be said, and I trust abler pens than mine will do it justice. No pupil was ever more inspired by a great master. His admiration and love for Lister was not so far from worship. In the mellow autumn of his days, in his retirement from active professional work, he lived again those fruitful Edinburgh hours when he walked the wards of the Royal Infirmary, and under the benign guidance of his revered chief helped to write into the history of science's greatest achievement the first chapters of the new surgery. One could never be long with Stewart without his recalling some incident or other relating to Lord Lister; "little bits of him," to use Sir James Barrie's words, that he picked up in the wards, in social life and elsewhere, and which quite unconsciously became part of himself. He introduced and ably practised the Listerian method of surgery, but he also reproduced Lister, the man. With his own character and personality the high qualities of mind and heart of Lister blended well. Such combinations rarely appear, except when great events are in progress.

After a long and, I am sure, a very happy, life he has passed to his reward. He has left our profession a very considerable endowment. Not so much because he was a good surgeon, a good soldier and a good Dean, but rather because he set before us the best ideals of our ancient calling and showed us by example how easy it can be to put them in practice. The place he held deep in the heart of the people shows that even in this somewhat perverse world there is still room for the man who tries to do his best.

In closing, one cannot do better than adopt the words and sentiment of Dr. Stewart, when in his first Listerian oration he took farewell of his revered chief: "For us, who knew and loved him, who drew so much of the inspiration and ideals of our lives from him, there cannot be any of the sadness that echoes in the old pagan formula of farewell, *Ave, frater, atque vale.* Rather would we say, *Nunc vale, care magister et amice, atque in æternum ave!*"

D. F. Fraser-Harris, M.D., D.Sc., London, writes:—

I should like to contribute a few words in memoriam of Dr. John Stewart, of Halifax. While we were on the staff of Dalhousie University it was my privilege to get to know him very well indeed, and for some years we sat together as representatives on the Medical Council of Canada.

As Dean of the Faculty of Medicine and Professor of Surgery at Dalhousie Stewart's name undoubtedly gave to the young school of medicine in the Lower Provinces the prestige of association with a great Listerian. For John Stewart was Lister's favourite assistant, and often have I heard him describe the now famous journey in the old four-wheeler from Lister's house in London to King's College Hospital for the delivery of his inaugural lecture as Professor of Surgery. Over the rough stones the cab rattled, and John Stewart had to sit very steady, nursing on his knee the precious test-tubes with sterile milk and undecomposed wine which had remained long in their original *status quo* because Lister, having boiled their contents, had carefully plugged the mouths of the tubes with cotton-wool. All very familiar to-day, but very strange in 1877, and particularly strange as a demonstration at an inaugural lecture on *Surgery.* What had sterile milk to do with wounds? Lister explained what it had in a lecture delivered to a few indifferent students and one or two bewildered seniors. But it was the dawning of a new day—the day of exact knowledge about surgical sepsis; and all the world was to benefit. In Moynihan's fine phrase: "Lister *opened* the gates of mercy for mankind". John Stewart helped him to swing back those gates.

Stewart's admiration for Lister almost amounted to worship; the Quaker and the Highlander were cast in the same mould, for both were conscientious, intellectually honest, reverent and deeply religious. Of course Stewart introduced the antiseptic method into Nova Scotia and was valued throughout the province for a skilful surgeon, but he lives in our memory less as a surgeon than as one of the most Christ-like men it has been our privilege to know.

Dr. Stewart had friends in every province of Canada as well as in the old country; he certainly was a delightful companion. To the innate courtesy of the Highlander he added the charm of a well-stored mind, for besides being an excellent classical scholar he had read widely and he loved poetry. His out-of-door interests were a study of birds, walking-tours, and photography. It was my delight some years ago to have a walking-tour with him through some of the most picturesque parts of Nova Scotia, and as we trudged along day after day I got an insight, otherwise unobtainable, into the charitableness, nobility and fineness of his mind. Though always dignified, there was nothing pontifical about Stewart, for he possessed the Scotsman's keen appreciation of true humour, and some of the best Scotch stories I know were told me by him.

Dr. Stewart was instrumental in founding the Lister Oration in Canada, and appropriately delivered

the first of the series himself; it was an exquisite tribute to his great master and contains some passages of poetic beauty.

Stewart's tastes were simple, and in the home circle he was the devoted brother. He was by nature a very generous sympathetic man, and, had his means permitted it, the scale of his benefactions would have been immense. A fine old Highland gentleman who never said an unkind or a hasty thing of anyone has passed over into the peace that passeth all understanding, and our profession has in consequence lost an atmosphere of sweetness and light.

The Rev. Prof. James W. Falconer, D.D., of Pine Hill College, Halifax, writes:—

While it is fitting that the *Journal* should refer most of all to the professional skill of the late Dr. John Stewart, who was the most distinguished surgeon of Nova Scotia, yet it would be a pity if no notice were taken of other aspects of a character that was so varied and so rich in quality. His love for his country was pure, intense, and free from all vulgarity and noise. So unselfish was it that, when others would regard themselves as beyond the age of active service, he went overseas in command of the Dalhousie Hospital unit, and gained not only the recognition of the Imperial authorities but also the affection of all members of his Unit.

He had a fine sense of literary values, was a lover of the Classics, and a master of a distinguished style, so that he could have excelled in the world of letters had he chosen that as his sphere of labour. He was an enthusiastic traveller, a keen walker, having gone by foot over most of our Province of Nova Scotia. At one time he walked from London to Edinburgh. The beauties of nature appealed strongly to him. I recall the way in which he described his delight when he first visited Germany, and spent a brief time in Saxon-Switzerland. He had many friends in the distinguished ranks of his profession, and kept up a regular correspondence with them, and when one heard him speak of the death of any of the companions of his early days, it was very manifest how genuine and heartfelt was his regret at their removal.

Religion held a central place with Dr. Stewart, and till the end of his life he scrupulously regarded the ordinances of the Church. His convictions were definite and drawn from deep sources. He prized very highly the traditions amid which he had grown to manhood—more especially those that clung about Scottish Presbyterianism. Worthy causes found in him an able and willing advocate, and for many years he was President of the Nova Scotia Branch of the Bible Society.

Among his younger friends, Dr. Stewart had come to hold a place quite apart. His deep reserve of strength, his noble presence, his chivalrous loyalty to lofty principles, his courtesy and kindness exercised a most powerful influence, which has not ceased with his death but remains with many as a purifying memory.

Irving Heward Cameron, M.B.(Tor.), LL.D.(Hon. Edin.), F.R.C.S.(Hon. Eng., Edin., Ire.), F.A.C.S., F.R.C.S.(C.)

Irving Heward Cameron, Emeritus-Professor of Surgery in the University of Toronto, died at his home on December 15, 1933, after a long illness, in his seventy-ninth year. In his death we have lost one who, with rare qualities of mind and heart, had adorned the profession of medicine for well nigh half a century.

* Mr. Cameron was born in Toronto, the son of Sir Matthew Crooks Cameron, Chief Justice of the Common Pleas of the Province of Ontario. He was educated at Upper Canada College and the University of Toronto. Beginning undergraduate study as a student of law, he transferred to the course in medicine, obtaining his Bachelor's degree in 1874. Early in his career he participated actively in university affairs. As a member of the Senate he played an important and effective part in bringing about the reorganization of the Faculty of Medicine in the University of Toronto in 1887. In that year he became Professor of the Principles of Surgery and of Surgical Pathology on the new staff. In August, 1892, he was appointed Professor of Clinical Surgery, and in 1897 he succeeded the late Dr. W. T. Aikin in the Chair of Surgery and Clinical Surgery. He retired in 1920 with the rank of Emeritus Professor. Mr. Cameron was a loyal son of his Alma Mater and served her interests with unswerving devotion, often at great personal sacrifice. A consultation had to be rearranged or cancelled if it interfered with a meeting of a committee of the Senate of which he happened to be a member. The same spirit influenced and controlled his activities in the hospital and the clinic. He played a leading part in the development of many projects relating to the University. He was one of the founders of the Alumni Association and at one time its President. He was among those who established the *University of Toronto Monthly*, and for a number of years was Chairman of the Editorial Board. He was prominent in initiating the movement that led to the erection of Convocation Hall and in the organization of the Faculty Union.

In connection with the Toronto General Hospital and the Hospital for Sick Children he rendered untiring service as surgeon. His influence was great in securing adequate provision for the teaching of medical students in these hospitals. For a time, early in his career, he was on the staff of St. Michael's Hospital, and for many years was a leading surgeon in the St. John's Hospital for Women, operated by the Sisters of St. John the Divine, on Major Street. In a broader field Mr. Cameron exercised an important influence. He was one of the founders of the *Canadian Journal of Medical Sciences*; past-president of the Canadian Medical Association (president in 1908), and of the Toronto Branch of the British Medical Association; a member of many societies, including the Société Internationale de Chirurgie and the British Association for the Advancement of Science. He was the author of numerous papers, addresses and reviews.

During the Great War Mr. Cameron rendered conspicuous service in organizing the surgical department of the Ontario Hospital for wounded soldiers at Orpington in Kent, where he was chief surgeon. He filled a similar position in the Canadian Hospital at Taplow. After returning to Canada at the close of the War he was appointed to the Board of Consultants for Canada. In that capacity he travelled long distances throughout the country, visiting hospitals and rendering service of the highest order.

In acknowledgment of his attainments and his service to humanity he was the recipient of many honours. These included Doctor of Laws of the University of Edinburgh (Hon.), Honorary Fellowships in the Royal College of Surgeons of England, the Royal College of Surgeons of Edinburgh, the Royal College of Surgeons of Ireland, and the Royal College of Surgeons of Canada. He was also a charter Fellow and Honorary Fellow of the American College of Surgeons.

* He preferred to be called "Mister" rather than "Doctor", following the British precedent for surgeons in that regard.

Mr. Cameron possessed qualities all too rare in the medical profession. Beyond the limitations of books devoted to medical science, he was a student of general literature and a classical scholar of no mean order. Endowed with an exceptional memory, he was proficient in apt quotation, a power he used with great effect both in public and in private. With these attainments it was natural to find him fastidious in his use of English and intolerant of slovenly methods of expression. A false quantity in pronunciation would often arrest his attention and induce comment. He objected to the term "appendicitis" because it was a hybrid of Latin and Greek and endeavoured, I fear unsuccessfully, to induce his students to call it "epityphlitis". There was a charm, almost unique, in his departure from narrow technicalities of medical study and in his effort to interest the student in the broader studies of a cultivated man of letters.

Mr. Irving Heward Cameron

Withal Mr. Cameron was a skilful surgeon enjoying the confidence and deep affection of a large clientèle in the community. He was also an inspiring teacher. As a young man he became a disciple of Lister and was among the first to introduce into surgical practice in this country the principles enunciated by that great master. Among the heroes he worshipped, both in science and in literature, Lister stood *facile princeps*. If during one of his annual visits to Great Britain he went to Glasgow, he would visit the Royal Infirmary and the old ward where Lister began the investigations that led to his great discovery. That indeed was hallowed ground to Mr. Cameron. These visits were akin to paying homage at the shrine of one of the immortals. Little wonder that he was among those who protested vehemently when, a few years ago, the trustees of the Royal Infirmary determined to demolish the old building. When in spite of protest this "vandalism" was accomplished, Mr. Cameron succeeded in securing a brick from the wall of Lister's ward. This brick was presented to the Faculty of Medicine in Toronto and now lies embedded in the wall of the library of the Banting Institute, immediately below the portrait of Lister. A suitable inscription narrates its story.

Mr. Cameron's unfailing courtesy, his liberal hospitality, and his personal culture and charm secured for him the esteem and devotion of many. His old students and a host of friends and admirers both in this country and overseas mourn his loss.

A. PRIMROSE

AN APPRECIATION

The death of Irving H. Cameron brings sorrow to his former students, because everyone who came under his influence and was taught by him must have had feelings of reverence and great affection for him. With his death all his students must feel how much his teaching and example influenced them. One of the things which a teacher sometimes likes to think is that his students go out with a feeling of gratitude towards him for what he has done or tried to do for them, and that this may endure through their lives. I think Mr. Cameron realized how much of this his students felt for him.

Looking back on student days my memories of his teaching are very clear. I can well remember certain amphitheatre and bedside clinics and the particular way in which he discussed the problem presented. In retrospect it seems to me there were three things particularly which he was trying to do for us; one was to teach us to appreciate the importance of principles and learn them, another to train us to think problems out for ourselves, and the third to use words properly. The majority of teachers will agree that it is not easy to teach principles to students. They are willing to take in facts which are "spoon fed", but the great underlying principles are not absorbed so easily, and yet in an education they are essential factors. The mere pouring of facts into the medical student's mind or note-book did not enter into Mr. Cameron's scheme of education. With reference to the proper use of words, all teachers know how difficult it is to have their students use language properly; we know how much confusion and difficulty arise because men employ the same words with different meanings. There was also the effort to give us the historical background and to trace the development of the knowledge of particular subjects. It is perhaps needless to say that Mr. Cameron was a learned man in the widest sense, particularly in his knowledge of the best in Greek, Latin and English. I must confess that sometimes he attributed to his students much greater knowledge than they possessed, particularly of the classics. We always tried to look as if we understood his quotations from Latin and Greek, even if we did not understand them.

The natural expression of his countenance was somewhat austere, but this did not represent the man, and I do not believe that any student who went to him for help ever received anything but the kindest welcome. He certainly possessed the gift of equanimity, the value of which William Osler dwelt upon so eloquently, under the most trying circumstances. I do not believe that anyone could have seen any change in his face, no matter how difficult an emergency confronted him. There were a number of traditions in the old Toronto General Hospital as to his presence of mind and ability to think out the best solution of a difficult problem on the spur of the moment. There was one occasion on which his quiet advice to another surgeon, rattled by an unexpected emergency, saved the patient's life. He had chanced to come in the operating room a minute before.

Curiously enough, very little comes back to me regarding his operative work. One thing has remained in my mind and that was his answer when asked what instruments he would require for an operation; his usual reply was "A sharp knife and a piece of string." This was not meant to be taken absolutely literally, but he had the art of operating with a minimum number of instruments. In those days when the house surgeon had to prepare all the instruments himself and clean up afterwards (there being no

operating-room nurse) this was of some importance.

He was exceedingly devoted to his patients and their welfare. As a rule if he had a patient in the hospital who was very ill or on whom he had operated that day, he usually came to the hospital some time between 1 and 3 a.m. We used to wonder how many hours of sleep he had.

I do not remember with certainty what led to the beginning of our friendship, but my recollection is that it had to do with the history of the Cameron clan. Later, the love of horses was a common ground of interest. Those of earlier days will remember his high dog-cart with the upright figure and the whip held at a proper angle with a ceremonious salute in greeting.

There was a dignity and a presence about him which was impressive. He was a great gentleman in the best sense of that term. He took an important part in the development of the Medical Faculty of Toronto University after its re-establishment in 1887. But those of us who were his students will treasure the memory of our teacher, learned, kind, interested in our welfare and progress, and setting us the example of honest thinking with kindness to and consideration of our patients. *Ave atque vale.* THOMAS MCCRAE

Dr. Henry Barker Carmichael, of Montreal, died at Bournemouth, England, on December 19, 1933. He had been in failing health for a year or more, and had gone to Bournemouth in the hope that he would be benefited.

Dr. Carmichael was in his 67th year, having been born at Clinton, Ont., on September 2, 1866. He joined the Grand Trunk Railway in 1893 at Montreal as district medical officer, and became divisional surgeon in 1905. He was appointed acting chief medical officer in 1916 and became assistant chief medical officer of the Canadian National Railway in 1928. He practised in Point St. Charles, Montreal.

Almost one of the first members of University Lodge A.F. & A.M., Dr. Carmichael was a keen Mason, and was Worshipful Master of his lodge in 1918, and District Deputy Grand Master in 1922.

His death removes one of the few remaining links of the family of the late beloved Bishop James Carmichael with Montreal. There is now only one son remaining, Frederick Carmichael, formerly of the Bank of Montreal, and now resident in Toronto. Bishop Carmichael had four sons, the eldest of whom was Canon James Carmichael, rector of Knowlton, who died about a year and a half ago, while Saumerez Carmichael, who practised law in Montreal, died some years ago.

Dr. Carmichael is survived by his wife, formerly Miss Mabel Jay, principal of St. Helen's School, Dunham, Que. There is no family. Interment was in Montreal.

Dr. Leonard Hugh Douglass, of London, Ont., died on October 11, 1933, after an operation on the jaw. On graduation from the University of Western Ontario in 1905 he located in Springfield where he practised until 1914 when he enlisted in the C.A.M.C. as lieutenant, later being promoted to major. Since the War he had been in charge of the Outpatient Department of Westminster Hospital. For five years he served as alderman of London and for several years as Chairman of the Board of Health. Surviving are his wife, formerly Della Newell, of Springfield, and two children, Marion and Hugh.

Dr. Joseph Gamache died on December 10, 1933, at the Hôtel-Dieu du Précieux-Sang, of Quebec, where he had been ill since October. Dr. Gamache was born in 1879 at L'Islet, and graduated in medicine at the University of Laval, Que., in 1913. He then settled in Pont-Rouge where he practised for the rest of his life.

Colonel George Macdonald, one of Calgary's senior physicians and for many years prominent in military affairs, died suddenly at his home on November 4, 1933, at the age of seventy years. To his many friends here, his death, coming with such suddenness, was a shock. His attractive personality and his fine erect figure will be greatly missed from our midst.

Coming to Montreal in 1869, from Aberdeenshire, Scotland, he there received his early education and later on his school days were spent at Renfrew, Ont. Entering McGill University, he graduated in medicine in 1889. After a year of practice at Renfrew, he came to Calgary in 1890, but only remained there a year, when he left for the far north; he only returned to Calgary in 1900 after he had made the long overland trip to the Klondyke, during the days of the memorable gold rush, leading a party of prospectors from Edmonton. This hazardous trip took eighteen months to accomplish. He practised in Calgary from 1900 until the outbreak of the war, when he was placed in command of the 12th Mounted Regiment, with which unit he went overseas in 1915. Following his return to Calgary in 1917, he was for two years in charge of military district No. 13, and later was appointed to the medical staff of the Belcher Military Hospital, where he remained until shortly before the time of his death. He was a member of the American Public Health Association, and of the British, the Canadian, and the Alberta Medical Associations. For some years he was registrar of the College of Physicians and Surgeons of Alberta. He was a prominent member of the Masonic order and was Grand Master of the Alberta Lodge in 1905 and 1906. His wife predeceased him a few years ago. He was given a military funeral from the Pro-Cathedral of the Redeemer. G. E. LEARMONTH

Dr. George Arthur Ings, of Fort McMurray, Alta., died in Edmonton on October 11, 1933, at the age of sixty-nine years, following a short illness.

He was born in Charlottetown, P.E.I., where he received his preliminary education. He took up the study of medicine at Edinburgh University, becoming a licentiate of the Royal College of Physicians and Surgeons in 1890, and in the same year a licentiate of the Faculty of Physicians and Surgeons of Glasgow. For several years subsequent to this he was physician to Queen Liliuokalani of the Hawaiian Islands.

He registered in the Northwest Territories in 1899 and settled in Calgary, where until the outbreak of the war he was a prominent surgeon. He enlisted with the Canadian Army Medical Corps, going overseas in 1915 and spending a considerable period in France. He resumed practice in Calgary for only a short time following the termination of hostilities. The pioneering spirit was ever with him and he went to the far north at Fort McMurray, where he continued to practise until he had to come down to Edmonton for medical care, where he died suddenly.

He is survived by his wife, a son and two daughters.

Dr. Edward Joseph Madden, a graduate of Toronto University, died suddenly in Calgary on March 13, 1933, at the age of fifty-seven years. Following his graduation he came to Calgary in 1907, where he practised until the time of his death. His wife, now resident in Collingwood, Ont., and two children survive him.

Dr. John Peat Mackie, Toronto, died at his late residence on December 15, 1933, in his 53rd year.

Doctor Mackie was a graduate of Queen's University, Kingston (M.D., C.M., 1922).

News Items

Great Britain

The Norman Gamble Fund and Research Prize.—The Council of the Royal Society of Medicine has accepted as a trust the sum of £1,000, presented by Mr. Norman Gamble for the purpose of providing a prize of £50 every fourth year for the best original work in Otology carried out during the preceding four years, the balance of the fund to be used for the purpose of awarding grants in aid of research work in Otology. The prize is open to any British subject, whether lay or medical. The Committee of Award will consider applications for the prize and for grants in aid of research work in October, 1934. Applications must be received by, and regulations may be obtained from the Secretary of the Royal Society of Medicine, I Wimpole Street, London W.1, not later than September 30, 1934.

We are pleased to announce that Professor Robert Muir was among those who received the honour of knighthood at the New Year. Sir Robert Muir is well known in Canada, having been present at the joint meeting of the British and Canadian Medical Associations held at Winnipeg in 1930, and also having been Listerian Orator at the Annual Meeting of the Canadian Medical Association held last year at Saint John. He has been for nearly thirty-five years Professor of Pathology at Glasgow University and has a world-wide reputation as a great teacher and a distinguished student in the fields of pathology, bacteriology and immunology. His text-book on pathology is a favourite work.

Dr. Swale Vincent, for sixteen years Professor of Physiology at the University of Manitoba (1904-1920), and for ten years Professor of the same subject at the University of London, died recently. Those who knew him in this country will regret his passing. He was well known for his able work in connection with the subject of endocrinology. Among his many honours he had the degree of LL.D., Manitoba and was a Fellow of the Royal Society of Canada.

Alberta

At the annual meeting of the Alberta Association of Public Health Workers, held in Calgary, Dr. A. McGougan, of Edmonton, was elected *President*, and Dr. W. H. Hill, of Calgary, *Corresponding Secretary* for 1933-1934. Dr. W. H. Hill read a paper on "The control of communicable diseases"; Dr. Geraldine Oakley one on "The medical supervision of schools," and Drs. G. M. Little and W. G. Saunders one on "Provincial preventive service through health units."

The annual elections for district representatives for the Council of the College of Physicians and Surgeons of Alberta resulted in all four members being re-elected. These were Drs. W. G. Anderson, Wardlow, for the Medicine Hat District, R. Parsons, for the Red Deer-Banff District, A. E. Archer, Lamont, for the District north of Edmonton, and W. A. Wilson, Edmonton, for Edmonton City.

At the recent meeting of the specialist's committee of the University of Alberta only three applications were recommended, one in internal medicine, one in radiology, and one in surgery, under clause three which is being repealed. G. E. LEARMONTH

British Columbia

Under an agreement which has recently been concluded between the Vancouver Medical Association and the City Council and Provincial Government, in future, relief patients in the city will be able to have free choice of doctor. A monthly grant to cover this service will be made to the Medical Association, and these sums will be divided *pro rata* amongst the physicians who have done the work. While the basis of payment will be small, it is felt that the recognition of the principle that relief work should be paid for is an important gain.

Powers to enforce quarantine of a case of tuberculosis were obtained by the Health Officer of Vancauver from the City Council recently. It was stated that the patient was a menace to the health of others, and refused to submit to suitable care.

Representatives of the hospitals of British Columbia have requested the provincial government to restore the per capita grant of 45 cents to the former 70 cents. A provincial tax on meals in public places, which had been expected to furnish funds to assist hospitals, has been successfully attacked in the courts, and the hospitals are finding it increasingly difficult to arrange their budgets. While income is steadily shrinking there has been no appreciable reduction in operating costs.

The summer school of the Vancouver Medical Association will be held this year from June 26th to 29th. C. H. BASTIN

Manitoba

At a recent meeting between the executive of the Joint Committee of the Winnipeg Medical Society and the Manitoba Medical Association, representatives of the Board of Directors of Victoria Hospital, and members of the former honorary staff it was agreed that Victoria Hospital would adopt the same regulations with regard to unemployed on relief as are now in force in all hospitals in greater Winnipeg, except the municipal hospitals. Arrangements were made for conferences between those members of the honorary staff who recently resigned and the directors of the hospital. In the meantime the members of the former honorary staff will devote themselves to the establishment of an efficient medical and surgical service. The pathologist was asked to withdraw his resignation.

Under the auspices of the Winnipeg Medical Society and the Cancer Relief and Research Institute of Manitoba a public lecture was delivered on December 4th in the University building, Broadway, by Mr. Shirley R. Cragg, Toronto, consulting engineer of the Eldorado Mines Limited, on "The physics of radium and its application in therapeutics."

At a meeting of the staff of the Winnipeg General Hospital on December 11th it was decided to recommend to the Board of Trustees certain changes which it is believed will add to the efficiency of the hospital and increase the accommodation for paying patients. A room will be fitted up for cystoscopy and "punch" operations on the prostate, and an additional operating room will be provided for the Ear, Nose and Throat Section. The functions of the Advisory Committee of the staff will be extended. ROSS MITCHELL

New Brunswick

Dr. Mabel Hanington, Medical Inspector of Public Schools for the City and County of Saint John, tendered her resignation on December 21st. Dr. Hanington was a pioneer in the work which she has just relinquished. Her appointment was made fifteen and one-half years ago, following agitation by the Women's Council. The usefulness of the service was immediately evident, and it was subsequently taken over by the Sub-District Board of Health. Later on she was absorbed into the Medical Inspection of School Service under the Provincial Department of Health. She has been acutely interested in all measures promoted for the care of the feeble-minded and has served as Secretary of the New Brunswick Council for Mental Hygiene, and has held office in the National Council of Women along similar lines. Dr. Hanington has been in poor health for some time and intends to go south, with the hope that a change of climate will be of benefit. Her resignation brought forth many comments, both lay and professional, in praise of her long and faithful service to the schools of Saint John.

Dr. Howard B. Bustin, of Fairville, N.B., was appointed to fill the vacancy caused by the resignation of Dr. Hanington. Dr. Bustin graduated from McGill, was an interne in the General Hospital at Saint John, and has been in practice for eight years. He served overseas with the Tenth Siege Battery.

Dr. H. A. Farris was elected in December President of the Saint John Association for the Prevention of Tuberculosis. This Society has done an immense amount of work along its designated line for the last number of years, and Dr. Farris has been constantly associated with the Association in its work.

Those who yearn for the good old days have had their wish granted, so far as winter weather is concerned, in the end of 1933 and the beginning of 1934. Practically all records have been broken since such records have been kept in New Brunswick, both for the amount of snow and for low temperature. These difficult circumstances have increased the dangers and hazards of the practice of medicine which were well exemplified in an accident which happened to Dr. F. C. McGrath, of Newcastle, recently. Called to attend a patient somewhat off the beaten track, Dr. McGrath proceeded as far as possible by train, then some distance further by horse and sleigh. Finally he was forced to don snowshoes and travel across the country, and while thus engaged broke through the ice of the Barnaby River, where he remained immersed to the shoulders for more than half an hour. The Doctor was finally able to haul himself to the bank, and in thirty degrees below zero weather made his way to a neighbouring farm house, where after a change of warm clothing he was able to proceed to attend to his patient. The local press has taken considerable notice of this exploit of Dr. McGrath's, and points out that such difficulties are accepted by our New Brunswick physicians as part of their daily routine. The fact that the depression renders payment of bills rather a matter of fickle fortune does not add any glamour to the hard-going of the rural physician.

Dr. L. M. Curren, for many years Senior Surgeon on the staff of the Saint John General Hospital, has resigned, having reached the age limit set down by the by-laws. Dr. A. E. Macaulay has been appointed Senior Surgeon. Other changes due to this shift include the appointment of Dr. C. L. Emerson to the Senior Surgical Staff and Dr. R. M. Pendrigh to the Junior Surgical Staff. Other appointments to the Junior Medical Staff include Drs. J. P. McInerney, W. M. McDonald, and W. J. Murphy. New appointments to the Pædiatric Staff include Drs. W. J. Baxter and G. Gordon A. Corbet. Dr. George M. White was appointed Junior Obstetrician. New Out-Door Surgical appointments include Drs. A. L. Donovan and Chipman McKay.

Dr. Margaret Parks has been appointed as resident physician at the Lancaster Hospital, Department of Pensions and National Health. A. STANLEY KIRKLAND

Nova Scotia

The news of the death of Dr. John Stewart, at the ripe age of eighty-six, causes deep regret throughout Canada, but more particularly in his native province which he had served so faithfully for many years. His health had been failing for some time, but it was not generally known that he was growing worse during the last month. Dalhousie University mourns the loss of her first Dean of Medicine, an office he undertook in 1919 after his return from service in the Great War.

The Minister of Health for the province, Hon. Dr. F. R. Davis, in a New Year's message, points out that the deaths from certain important diseases, such as diphtheria, scarlet and typhoid fevers, tuberculosis and whooping cough, have reached new low levels for the past year. He sounds a warning note that criticism of money spent on public health measures should not be indiscriminate.

Dr. F. E. Lawlor has returned to assume his duties as Superintendent of the Nova Scotia Hospital. He has been away on a year's leave of absence on account of illness. N. B. DREYER

Ontario

At the annual meeting of the Hamilton Health Association it was announced that the death rate from tuberculosis had reached the low point of 28.5 per 100,000 population, the lowest figure in the city's history.

Arrangements have been completed with the Motor Vehicles Branch of the Department of Highways whereby practising physicians will be issued distinctive license numbers for their cars. The series D-8000 to D-9999 will continue, as in previous years, to be used by the Toronto physicians who will apply for their markers through the Academy of Medicine. Series D-1 to D-7999 will be open to members in good standing in the Ontario Medical Association resident outside the area of the City of Toronto. These will be issued only through the office of the Ontario Medical Association, 184 College Street, Toronto.

The newspapers of December 23rd announced that the Ontario Government expected, before the end of January, to place another 500 milligrams of radium in the clinical centres at Toronto, London, and Kingston. The present supply at these three clinics is about 800 milligrams.

Dr. John A. Macgregor, of London, has been elected Honorary President of the Osler Society for the University of Western Ontario, and will deliver the Osler Oration at the annual banquet.

A. S. Kilgour (M.B. Tor., 1922), of the staff of the Psychiatric Hospital has been awarded a Fellowship by the Rockefeller Foundation, to pursue special studies in Great Britain and the Continent.

J. H. ELLIOT

Saskatchewan

At the December clinical meeting of the staff of the Regina General Hospital five cases were presented: Dr. Ritchie had a case which had been diagnosed before death as syphilis of the stomach. At post-mortem it was found that a gastric ulcer had ruptured into the transverse colon. A perfect gastro-colic fistula had been formed, the edges of which had been healed completely.

Dr. Kraminsky reported the case of a male, aged 29, who had been diagnosed as having duodenal ulcer. At operation the entire stomach was found to be shrunken and the stomach and bowels presented a leathery appearance. The diagnosis was linitis plastica.

Dr. Sauer presented a boy, aged 10, who had a fistula of the small bowel after injury. Two anastomoses were done and a week after the operation the boy's condition was good.

Dr. Moore reported a case of prolapse of the rectum in a female aged 56. She had had nine children. Six years ago she had had an operation in Alberta. One year ago Dr. Moore operated here. The rectum was sewed to the posterior wall of the uterus. This year the woman came in for ventral hernia, which was repaired under local anæsthesia. Moving pictures of the prolapse of the rectum were shown.

Dr. Thomson presented a case of a male, aged 35, who complained of weakness of the legs and pain in the right lower quadrant of the abdomen. His knee-jerks and ankle-jerks were absent. The Babinski reflex was negative. His voice was husky. He had "scissors gait" and nystagmus and was being catheterized. There was no intention tremor and no scanning speech. The diagnosis was disseminated sclerosis, though the picture was not typical of this. LILLIAN A. CHASE

United States

Dr. Theobald Smith of the Rockefeller Institute, Princeton, N.J., has been awarded the Copley medal of the Royal Society of London in recognition of his original research and observations on diseases of animals and man.

One of Dr. Smith's most notable achievements was the discovery that Texas cattle fever was caused by the bite of an infected tick. This work was done while he was with the United States Department of Agriculture in Washington. This discovery showed the way to prevent the fever which had been causing tremendous economic loss to the cattle industry. Another of his important contributions to science and the welfare of mankind was the discovery of the cause of bovine tuberculosis. He was the first to distinguish the bacillus of this disease from the bacillus of human tuberculosis.

General

Report of the Trustees of the Banting Research Foundation.—The Foundation has now been in active operation for six and a half years, though in the first two years the full capital sum was not available and the number of grants made were few. The capital sum now amounts to about $700,000, and the number of individual grantees has steadily increased. The total number of grants made during the period was 92. These have been distributed to 65 workers in the following universities: Alberta 4, Saskatchewan 2, Dalhousie 8, Queen's 2, Western Ontario 2, Manitoba 16, McGill 26, Toronto 30, and 2 non-university. Some 50 papers have already appeared in scientific publications, while some 15 papers are in press or ready for publication. Several pieces of work are not as yet complete.

In accordance with its charter, the Foundation also aids in the support of the Department of Medical Research (Dr. F. G. Banting), and from this source numerous papers have appeared, including some dealing with the problem of silicosis and with the action of vitamins.

Important papers on the following subjects have been published during the past year by grantees: On the Functioning of the Thyroid Gland (A. C. Abbott, Manitoba); Gastric Secretion (A. M. Alley, McGill); Anterior Poliomyelitis (M. Brodie, McGill); Addison's Disease (M. M. Cantor, Alberta); Fungous Diseases of the Skin (A. M. Davidson, Manitoba); Glycogen Metabolism (G. T. Evans, McGill); Thorium Oxide and the Reticulo-endothelium (R. Gottlieb, McGill); Urate Excretion (H. C. Graham with E. G. Young, Dalhousie); The Effect of Choline on Fat-metabolism (J. M. Hershey and C. H. Best, Toronto); The Fate of Lactic Acid in the Body (F. L. Horsfall, Jr., McGill); On the Function of the Lachrymal Gland (P. R. McDonald, McGill); A Study of the Histology of the Human Ovary (D. Mainland, Dalhousie); On the Obstetrical Forceps (J. Mann, Toronto); Cholesterol Metabolism (J. M. McEachren, Manitoba); The Action of Drugs on the Uterus (R. A. Moreash and N. B. Dreyer, Dalhousie); Urinary Antiseptics (D. R. Mitchell and J. M. Scott, Toronto); Serum Bilirubin (F. D. White, Manitoba).

During the past year twenty workers received grants from this fund. The Trustees feel assured that the work done under the ægis of the Foundation has been of real value and that the Foundation, which is the only one in Canada lending its support to medical research, has proved a valuable aid and stimulus to such research in Canada. As with all such Foundations, the depression has increased the demands upon it and a larger revenue could be expended with advantage.

VELYIEN E. HENDERSON,
D. T. FRASER,
Honorary Secretaries.

International Post-graduate Medical Courses in Berlin.—The Association of Lecturers for Medical Post-graduate Instruction has arranged, in common with the Medical Faculty and the organizations of the Empress Friedrich-House, during March/April, 1934, the following continuation courses:

1. Internal medicine, with participation of the 1st and 2nd Medical University Clinics of the "Charité", of the 4th Medical University Clinic (Infirmary Moabit), and of the Martin Luther Krankenhaus, from the 5th to 17th March. Fee: RM 60.
2. Roentgenology: March/April. Fee RM 75.
3. Continuation course for surgeons (including one day of operative gynæcology), from the 9th to 14th April. Fee RM 75.
4. Malignant tumours, taking into particular account early diagnosis. March/April. Fee RM 50.
5. Inheritance and constitution in the practice of medicine, from the 23rd to 28th April. Fee RM 40.
6. Individual courses covering all phases of medicine, with practical applications, take place every month.

Those attending the course will receive a reduction of 25 per cent on railways of the German State.

Programs and further particulars may be obtained from the office of the Geschäftsstelle der Dozentenvereinigung für ärztliche Fortbildung), Berlin NW 7, Robert Koch-Platz 7 (Kaiserin Friedrich-Haus).

The scurvy-preventing vitamin C has been prepared synthetically by Dr. T. Reichstein and associates at the Polytechnic Institute of Zürich, who obtained pure crystals of l-ascorbic acid, considered to be identical with vitamin C. Dr. Poul Schultzer, resident physician of the Copenhagen Municipal Hospital, has reported that a case of scurvy in man was cured by injections of ascorbic acid, formerly called hexuronic acid.

Cyclopropane, a gas anæsthetic discovered by Prof. V. E. Henderson, University of Toronto, was used for the first time on a series of patients by Drs. J. A. Stiles and W. B. Neff at the University of Wisconsin.

Prof. H. S. Raper, Brakenbury Professor of Physiology in the University of Manchester, and formerly on the staff of the University of Toronto, has been appointed a member of the British Medical Research Council.

Miss Elizabeth Smellie, chief of the Victorian Order of Nurses, has been made C.B.E. in the New Year's Honours. She graduated in nursing from a Baltimore hospital and subsequently spent three years nursing overseas. She was mentioned in dispatches and later was awarded the Royal Red Cross, first class. Miss Smellie came to Canada ten years ago to assume her present position. Last year she was sent by the Rockefeller Foundation to European countries to report on maternal welfare.

The Fourth International Congress of Radiology: Zurich, July 24th to 31st, 1934.—More than 8000 invitations have been sent to the members of the radiological societies participating in the Congress, and a satisfactory number have already signified their intention to attend. The President of the Swiss Confederation will open the Congress on July 25, 1934. At this meeting Professor Gösta Forssell will report on the organization of the cancer campaigns in general. Other speakers will report upon the measures in their own countries. The majority of the speakers invited by the Committee have accepted. The program of the General Meetings is as follows:—x-ray diagnosis of bone tumours, Kienböck, Vienna; pulmonary tuberculosis as seen radiologically, Herrnheiser, Prague; radiation treatment of uterus-carcinoma, Lacassagne, Paris; radiation treatment of malignant tumours of the mouth and pharynx, Perussia, Milan; radiation genetics, Muller, Austin, Texas; mitogenetic radiation Gurwitsch, Moscow; structure analysis, Bragg, Manchester; identical physical measurement of the dose in x-ray and radium treatment, Holthusen, Hamburg; hard gamma-rays, cosmic radiation, earth-radiation, Sievert, Stockholm; short-wave therapy, Carelli, Buenos Aires. An able discussion of these various topics is assured. President, Prof. Dr. H. R. Schinz, General Secretary, Dr. med., H. E. Walther, Zurich, Gloriastrasse 14.

Book Reviews

Migraine; Diagnosis and Treatment. Ray M. Balyeat, M.A., M.D., F.A.C.P., Associate Professor of Medicine, University of Oklahoma, etc. 242 pages, illustrated. Price, $3.00. J. B. Lippincott Co., Lond., Phila., and Montreal, 1933.

According to the author of this excellent book, some 7 per cent of the people of the United States suffer at some time from migraine and the economic disability from this affection is by no means negligible, and yet, until five years ago, the subject was comparatively neglected. Even now few studies have appeared which summarize the clinical experience of individual physicians or institutions with any large series of cases. Dr. Balyeat has set himself to repair this defect and gives us his conclusions derived from a study of about 350 cases, together with detailed reports of 53 of allergic type illustrating different phases of the disease and his experiences with various forms of medication.

Dr. Balyeat defines migraine as "A paroxysmal disease characterized by hemicrania and symptomatic evidence of cortical involvement." Headaches due to allergy may appear as migraine with evidence of cortical affection or may be hemicrania without sensory, motor, or vascular phenomena. In short, all migraine is headache, but all headache is not migraine. The author gives a valuable discussion on the etiology of migraine and concludes that no one theory is entirely satisfactory. The allergic theory, however, comes nearest to explaining satisfactorily the common occurrence of migraine in early life, its frequent occurrence without evidence of organic change, and its sensory, motor, and vasomotor manifestations. In regard to inheritance he believes that migraine is transmitted as a dominant character and is not sex-linked. Several charts are presented which prove this. It is important to note that the author does not consider that any specific allergical state is transmitted, but only the tendency to become allergic. Consequently, individuals of migrainous stock may exhibit various reactions—may manifest migraine, asthma, urticaria or eczema, or more than one of these. The influence of diet is fully discussed and sensitization to certain food-substances is regarded as a potent exciting factor in the causation of the disease. There is no special pleading in the book and the available facts are set forth judicially and carry conviction. Those who wish the last word on the subject of migraine and its congeners cannot do better than buy this book.

Operative Surgery. Vol. 7. Warren Stone Bickham, M.D., and Phar.M. (Tulane), M.D. (Columbia), F.A.C.S., Former Surgeon in charge of General Surgery, Manhattan State Hospital, N.Y., and C. M. Smyth, Jr., B.S., M.D., F.A.C.S., Assistant Professor of Surgery, Graduate School of Medicine, University of Pennsylvania. 849 pages, illustrated. Price $11.50. W. B. Saunders, London and Phila.; McAinsh, Toronto, 1933.

This is a volume of operative surgical technique in which the writers bring up to date the work outlined in six previous volumes of that excellent system of surgery published by Bickham in 1924. The work is well and carefully done, and contains a very large number of clear-cut and well-defined illustrations depicting the various stages in the operations described. While it is almost impossible for an author to include in one book all the recent advances in operative surgery, the attempt has lead in some places to very brief treatment, but as a whole the authors' selections are sound.

The first chapters deal with general considerations, the progress, specialization and future of surgery, as well as the legal and public responsibilities. The control and supporting of physiological functions in operative procedure is pointed out, together with this same maintenance in pre- and post-operative care. In this connection the physiology of acidosis, alkalosis, etc., are discussed.

The different methods of skin-grafting are illustrated as well as some recent plastic procedures. The field of bone and joint surgery is covered quite thoroughly, and contains very much valuable material on amputation, bone-grafting, including Henderson's massive bone-graft, and Nicola's operation for recurring dislocations. A chapter is devoted to the different uses of living fascia, and the work on blood-vessel surgery includes a clear description of periarterial sympathectomy. The fields of neurological and chest surgery are brought up to date by including some of the more recent work in these fields, such as drainage of the cisterna magna and Lilienthal's chest work, along with recent cardiac surgery. The chapters dealing with the herniæ and intestinal tract are clear and concise, and the illustrations in this part are particularly good. Chapters on gynæcology and urology maintain the same standard, although here there is little that is new.

The work is well planned and arranged to harmonize with the previous volumes; it covers the advances in surgery remarkably well.

Operative Surgery, The Abdomen and Rectum. Vol. 2. Martin Kirschner, M.D., University of Tübingen, (Germany). Authorized translation by I. S. Ravdin, B.S., M.D., J. William White Professor of Research Surgery, University of Pennsylvania. 569 pp., illustrated. Price $13.00. J. B. Lippincott, Philadelphia, London and Montreal, 1933.

The author emphasizes in his "Foreword" the difficulties under which the present work was developed and composed. One reading of the book does not reveal any evidence that the general excellence of the text, both internal and external, has suffered by the multitude of extraneous labours the author had to control during the years of sifting data and of literary production. It is the same exhaustive study and experience of the subject and the same detailed yet simple method of presentation one would expect from the author of the first volume published in 1931.

The field of abdominal surgery, including the rectum, is very fully covered. The mechanics of abdominal surgery are clearly described and, aided by some four hundred coloured illustrations, there is little excuse for the student of surgical technique if he fails to get a safe and sound guidance to the operative problems of the abdomen. But the work is of course much more than this. Surgical anatomy, physiology and pathology weave themselves into the exposition so that one finds oneself viewing the whole field of abdominal surgery while primarily engaged in studying a method of performing an operation.

The book has its shortcomings. Perhaps some elaborate details could be left out without weakening the general erudition of the text. An old student of Moynihan's work is wont to wonder if there is anything more to say worth saying. But Professor Kirschner has undoubtedly given a valuable work to our profession and one that can be highly recommended to teachers and students of abdominal surgery.

Surgical Anatomy. Grant Massie, M.B., M.S., F.R.C.S. (Eng.), Assistant Surgeon, Guy's Hospital. Second edition; 458 pages; illustrated. Price $6.00. Lea and Febiger, Phila., 1933.

This book reflects the experience of its author, whose training has been singularly well apportioned between anatomical teaching and surgical practice. It is a balanced recounting of the outstanding anatomical structures, lucidly presented, and discussed in the light of surgical experience. The book will not compete with the more exhaustive compilations of anatomical facts that every surgeon must reckon with, but it is an ideal work for medical students and practitioners who have lost their sense of proportion after intensive study of conventional text-books. The edition, besides some revision, includes new sections on the carpus, hand, surgical approaches to the long bones, and a final section on the sympathetic system.

Manual of Urology. R. M. LeComte, M.D., F.A.C.S., Professor of Urology, Georgetown University. 317 pages, illustrated. Price $4.00. William Wood & Co., Baltimore, 1933.

This book, which is intended primarily for students, should also be useful for practitioners. It outlines general methods of diagnosis and the treatment commonly in use, and deals in a practical manner with the etiology of common urological symptoms, such as frequency of urination, retention of urine, hæmaturia, etc., before discussing the various diseases. The subject matter is put down briefly, accurately and sets forth only generally recognized conclusions. It is thoroughly up to date. The illustrations are simple, accurate, and adequate. One can highly recommend this manual for the purpose for which it is intended.

Textbook of Physical Therapy. Heinrich F. Wolf, M.D., Chief of Department of Physical Therapy, Mt. Sinai Hospital and Dispensary, New York. 409 pages, illustrated. Price $5.50. D. Appleton-Century Co., New York, 1933.

The reading of this work is a revelation to the conservative physician or surgeon. Prejudice, well founded on the blatant claims of early enthusiasts, has closed the minds of too many medical men to the value of the therapeutic measures grouped under the title of this work, and while it is true that Physical Therapy Departments exist in most of our larger hospitals it is also true that full cooperation between these and the other departments is by no means general. A textbook such as this should help in curbing the enthusiasm of the physical therapeutist and inclining the clinician to an honest study of the possibilities of a rational application of physical therapy.

The book is written by a physician who has spent twenty years in its production. It is much more than a compendium of conditions amenable to various forms of treatment by physical means; it discusses the principles upon which every procedure is based, and cites experimental proof of many of the positions taken. There is almost as much emphasis upon what not to do as upon what should be done. The statements regarding hydrotherapy, heat therapy and light therapy are clear, and it is interesting to note that osteopathy is given a guarded approval in the chapter on mechanotherapy.

The use of physical therapy in the treatment of fractures is based upon the general principles that free mobility is the desired objective when the upper limbs are involved, while stability is the desired result in fractures of the lower extremities. Ankyloses are to be avoided at all cost in the one case and atrophies in the other. The more severe the injury, the greater the need for early and effective use of massage and electrotherapy. Remote complications, such as subsacromial bursitis resulting from an injury which produced a Colles' fracture, are stressed. A most interesting chapter on radiothermal treatment of infections such as pneumonia and gonorrhœa makes good reading, but the section on the application of physical methods in gynæcology does not evoke enthusiasm.

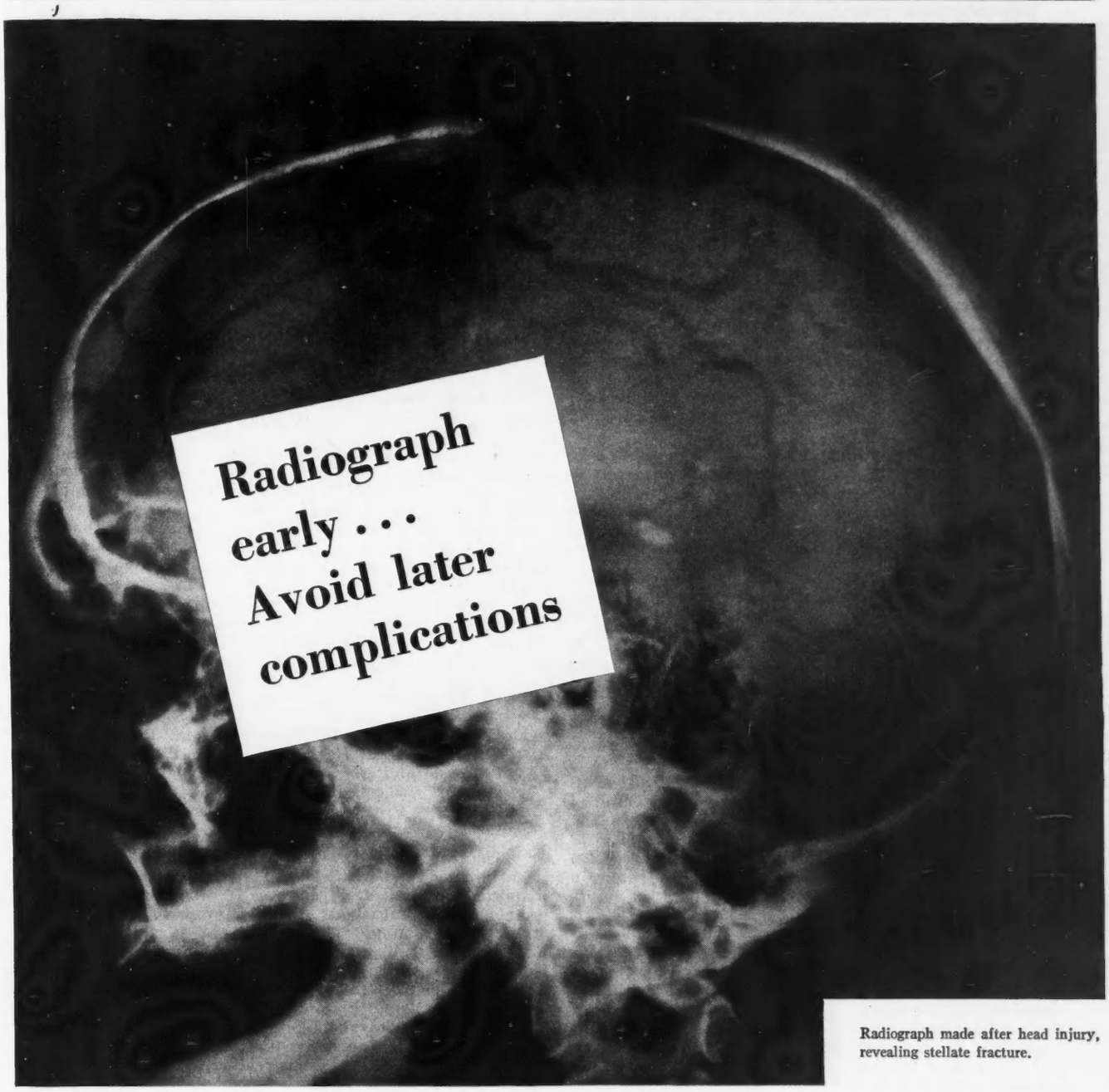
This is a timely book and will well repay careful study.

Bone Growth in Health and Disease. H. A. Harris, D.Sc., M.B., B.S., B.Sc.(Wales), M.R.C.S., M.R.C.P., Professor of Clinical Anatomy, University College, London. 248 pages, illustrated. Price $10.50. Oxford University Press, London; McAinsh & Co., Toronto, 1933.

This very delightful book opens with a study of certain transverse lines seen in the metaphysis of growing bones. These are called lines of arrested growth, and indicate periods of disease through which the subject has passed and during which time growth of bone has been arrested. These lines were first described by the author, and, as he points out, have nothing necessarily to do with the so-called white line of healing rickets. Lead-poisoning produces such lines of arrested growth, and it is seen even in the bones of the fetus as the result of congenital syphilis.

In describing cartilage the author vindicates the observations of other authorities (*e.g.*, Wm. Hunter, as far back as 1742) who maintained that no blood vessels traversed the epiphysial cartilage. Lexer and others, it will be remembered, depict anastomosis between the arterial fields of the diaphysis and epiphysis through the epiphysial line. Harris finds this erroneous, the vessels of the diaphysis being virtually end-arteries. Thus the phenomena of disease in the juxta-epiphysial zone are essentially the phenomena of infarction.

The chapter on the modelling and remodelling of



Radiograph made after head injury, revealing stellate fracture.

TO treat head injuries successfully requires a complete knowledge of all influencing conditions. Serious consequences can develop from some factor which may remain hidden unless a thorough x-ray examination is made. At the earliest permissible moment have your patient radiographed.

The routine radiographic examination of the head should be supplemented with various stereoscopic projections. Vertical views will reveal the presence of any fractures of the base. Other views taken from at least two different angles will provide facts about suspicious areas, depressed fractures, or fractures of the inner or outer tables.

Radiographic evidence in all head injury cases is invaluable. Sufficient radiographs to preclude the possibility of overlooking any secondary fractures are essential. Enlist the services of your radiologist at the earliest opportunity.

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bones is fascinating and instructive, but does not lend itself to abstraction. The author points out that fetal bones are laid down in cartilage in their adult shape long before there are any muscles to mould them by stresses and strains. This is a fundamental objection to the acceptance of the various mechanical and mathematical theories of bone growth, and the development of bony contours.

The article on rickets is most clear and comprehensive. X-ray and microscopic illustrations are profuse throughout the book.

The author quotes Bagg in regard to hereditary deformity of the limbs, such as club-foot and syndactyly. The illustration here is particularly good. The articles on chondrodystrophy or achondroplasia, Paget's disease, syphilis and tuberculosis are illuminating. The author brings into play throughout his special knowledge of anatomy and embryology, and the result is a book which indeed it is difficult to lay aside.

Diseases of Infancy and Childhood. Leonard G. Parsons, M.D., F.R.C.P., Professor of Diseases of Children, and Seymour Barling, C.M.G., F.R.C.S., Professor of Surgery, in the University of Birmingham. 1798 pp., illustrated, 2 vols. Price $25.00. Oxford University Press, London; McAinsh & Co., Toronto, 1933.

This work is a compilation of articles written by forty-one of the leading pædiatricians and surgeons in the British Isles, in addition to four from the United States, and one from Canada. As might be expected from the reputation of the editors, the work is wholly sound and sane. It follows the usual plan of dividing the discussion of the ailments into the various systems of Respiration, Circulation, etc. There is very little overlapping and where it does occur it only emphasizes the importance of considering some diseases from different angles. One is impressed by the fact that all the writers treat their subjects chiefly from the clinical standpoint. The laboratory findings are not neglected, but only the outstanding and important pathological changes are noted. One interesting and unusual section gives a description of all the measures adopted in Great Britain to safeguard the child both as to its physical well-being, and as to the preservation for it of some social status. The section on tuberculosis is unusually extensive, more particularly from the surgical point of view, and is replete with accurate diagnostic methods and measures for the correction of resulting deformities.

All surgical ailments common to children are dealt with just as fully and clearly as are the medical ones. At the end of the book is a series of excellent x-ray photographs, illustrating those conditions, where such pictures are of value.

In addition to these clinical discussions, there is a section giving in detail all the clinical methods of use in diagnosing and treating the ailments of the infant and child.

We know of no similar work that combines the usefulness of a text-book and work of reference so well as this, and its value will be appreciated equally by student, practitioner and specialist.

Binocular Vision and the Modern Treatment of Squint. Margaret Dobson, M.D.(Lond.), Ophthalmic Surgeon to New Sussex Hospital for Women and Children, Brighton. 107 pages, illustrated. Price $3.25, Oxford University Press, London; McAinsh & Co., Toronto, 1933.

This little book is printed on good paper in clear type. It is divided into the following chapters with sub-headings:— Binocular Vision; Binocular Balance; Suspension of Vision; Amblyopia; The Refractor and the Dynamic Retinoscope; Dynamic Retinoscopy in Cases of Squint; Orthoptic Training.

Each of these subjects is treated clearly, and with frequent reference to its clinical significance. The reasons behind many of our rule of thumb methods of refraction and muscular balance examinations are analyzed, and many points brought out which explain failures to give comfort to our patients. The practical difficulties in obtaining perfect convergent and accommodative results in every case are, however, very evident. Given sufficient time and patience on the part of both the oculist and the sufferer, much more can be done than is now generally being accomplished.

Whatever the practical results in ophthalmic practice may be from having a proper understanding of the theories of binocular vision and balance, and amblyopia, oculists will find in the theoretical part of this book a simple synopsis of many of the things which they ought to know, but which they either never have known or have ignored.

The portion of the book dealing with the application of the theoretical is perhaps more detailed in regard to the many forms of apparatus now in use to carry out diagnosis of imbalance anomalies and orthoptic training, and not as full as one could wish in regard to routine training, with actual results obtained by the author or her confrères. To the enthusiast in methods of curing strabismus without surgical intervention, however, the author offers a satisfactory scientific background and a wealth of apparatus to be tried.

Miss Dobson gives generous credit to others for the material to be found in her book, but she herself is one of the foremost authorities on her subject. Her advice can be confidently followed by those who are looking for up-to-date leadership in this important branch of ophthalmology.

The Thyroid Gland: Its Chemistry and Physiology. Charles Robert Harington, M.A., Ph.D., F.R.S., Professor of Pathological Chemistry, University of London. 222 pp., illustrated. Price $4.50. Oxford University Press, London; McAinsh & Co., Toronto, 1933.

The story of Dr. Harington's success in the identification and synthesis of thyroxine is of such importance that it deserves to be recorded in a volume that contains sufficient other material to make an appropriate setting. This short book is not only a concise review of those facts concerning the thyroid which can be stated in chemical terms, with incursions into the fields of pathology and physiology, but it also includes what is much more interesting and important, the story of a triumph in research told with modesty and clearness in a narrative that is fascinating and, at times, even thrilling. It is related how, in a period of about five years, the constitution of thyroxine was determined and the formula proved by preparing the compound by chemical synthesis. In the course of this work the author also identified the non-thyroxine portion of thyroidine at 3:5 diiodotyrosine. On the basis of this work it is concluded that thyroxine exists in the thyroid in peptide combination as a constituent amino-acid of the characteristic thyroid protein, thyreoglobulin. Dr. Harington's interpretation of thyroid activity is briefly as follows. The iodine adsorbed by the thyroid is combined with tyrosine to form 3:5 diiodothyrosine, some of which will be converted into thyroxine and stored as colloid (thyreoglobulin). From this is released an active secretion, probably a polypeptide containing thyroxine.

Equally interesting is his explanation of the variations observed in the relations between thyroxine (acid-insoluble) and diiodothyrosine (acid-soluble) fractions of the total iodine of different samples of thyroid. He assumes that four processes—iodination of thyrosine, synthesis of thyroxine, manufacture of colloid, and release of active secretion—go on simultaneously, and the velocity of the first and last of these factors will be modified by extraneous conditions,

namely, the supply of iodine and the demand for thyroid activity.

The opening historical chapters cover the orthodox ground in physiology, chemistry, and the general subject of goitre. In one instance the author steps outside the field of chemistry to take sides in a controversial question, when he concludes that there is no good reason for excluding "adenomatous goitre with hyperthyroidism" from the category of Graves' disease, an opinion which will be disputed by many clinicians. There is a bibliography of pertinent literature and a good index.

The Joy of Living. Autobiography by Dr. Franklin H. Martin. Two vols., illustrated. Price $7.00. Doubleday, Doran & Co., New York, 1933.

It has been given to few men to enjoy the privilege of a lifetime of experience in the medical world, both at home and abroad, such as that of Dr. Franklin H. Martin. In his recently published Autobiography we are given in cross-section a historical picture of his time, more especially from 1880 to 1920, an excellent résumé of the development of medicine in the United States, its transition from an art to a science and art. One of his main themes is concerned with the part that organized methods have played in regulating the environment of medicine, its social aspects, its educational requirements, and the various methods by which the teaching and practice of medicine were practically revolutionized.

The two interesting volumes which make up this Autobiography have not a dull page. Beginning with the Wisconsin era of the "Covered Wagon," Dr. Martin's early years of struggle to make ends meet as a farmer's boy, as a brickmaker, as an amateur carpenter, as a teacher, his early study of medicine, and his gradual progress upwards, are told in a way that will interest every reader, giving as it does a mirror of the times and localities in which he lived and studied. Peculiarly fascinating is the picture of the mother's influence over this shy boy who saw visions of a career as a doctor of medicine.

The evolution of Doctor Martin's career as a teacher and surgeon, as an investigator and writer, as founder of the unique *Journal of Surgery, Gynæcology and Obstetrics,* and, lastly, as the originating spirit of the American College of Surgeons, all these have placed him in the forefront of the medical profession as an educator, administrator and surgeon. No one has been more fitted to undertake the task. Dr. Martin is one of those men who will do things, and who will not wait upon the goodwill of associates or the backing of large communities. Nor should it be forgotten that in all these constructive endeavours, the duties were undertaken voluntarily without consideration of personal gain. Much of the first volume is devoted to the story of this American College of Surgeons, of the steps by which it developed and the great need of its existence, in order that surgery might be raised to a level of decency and respectability throughout the country. Critics may demur about the original plan, but no one with far-seeing vision can deny that the future of American surgery will be brighter and better as a result of his efforts.

The second volume deals with the achievements of the medical profession in the War, and affords the most illuminating account of these general efforts that has as yet been written. His own part in the early organization of the military medical machine is one of which any man can justly be proud. Indeed, as his autobiography tells us, he has memories not only of the Great War, but as far back as the Civil War and the Spanish-American engagements.

The style of the book is charmingly simple, never prolix, but always has that essentially narrative quality which makes it read like an interesting novel. The book is to be commended not only to members of the medical profession but to all those who are interested in the development of their country and the part that it has played in the public health of their nation.

The Operative Story of Cleft Palate. George Morris Dorrance, M.D., F.A.C.S., Professor of Maxillo-facial Surgery, Thomas W. Evans Museum, University of Pennsylvania, and E. Shirazy, D.D.S. 564 pages, illustrated. Price $7.50. W. B. Saunders, London and Philadelphia; McAinsh & Co., Toronto, 1933.

This volume is complete in every way. Doctor Dorrance and his co-workers apparently have spared no pains in reviewing the literature on the subject of cleft palate. It is, to our knowledge, the only complete review on record and will undoubtedly be of great value to those who are particularly interested in cleft-palate work, not only on account of the different types of operations described, together with their originators and photographs showing the method of employment, but also of the extensive bibliography.

The author recognizes the importance of closure of the naso-pharynx in order to obtain proper speech and his "Push-Back" operation as described would appear to give a mobile palate without in any way damaging the muscles which are chiefly concerned. The only criticism that might be offered is, that he has been too brief in his historiography, which makes the book somewhat less enjoyable to read.

What the Diabetic Needs to Know About Diet. By a Science Graduate and a Certified Dietitian (University of London), who have made a special study of the subject. 85 pages. Price, 2s. John Bale, Sons, & Danielsson, London, 1933.

This book is written to instruct the diabetic how to prepare his own meals so that there will be the least possible amount of difference between his own meals and those of the rest of the family. The authors have taken a very practical view on the subject. In the opening pages, they explain in a full and simple manner the basic considerations in the diabetic dietary; the present treatment of the disease, the place of insulin in this treatment, and directions for the measurement of food and for cooking. Self-treatment, provided he follows his doctor's directions, is impressed upon the patient, and his fears are allayed as to the curtailment of the length of his life.

The many and varied recipes giving the carbohydrate grams and calories, which comprise the bulk of the book, should be a boon to all diabetic patients.

BOOKS RECEIVED

Fundamentals of Biochemistry in Relation to Human Physiology. T. R. Parsons, B.Sc. (Lond.), M.A., (Cantab.), Sidney Sussex College, Cambridge. Fourth edition, 435 pages, illustrated. Price 10/6 net. W. Heffer & Sons, Cambridge, 1933.

Aids to Public Health. W. G. A. Robertson, M.D., D.Sc., D.Litt., F.R.C.P.E., Barrister-at-Law, Late Lecturer on Forensic Medicine and Public Health, Surgeons' Hall, Edinburgh. Third edition, 208 pages. Price $1.10. Baillière, Tindall & Cox, London; Macmillan Co., Toronto, 1933.

Herzneurosen und Moderne Kreislauftherapie. By various authors. 159 pages, illustrated. Price RM 10. Theodor Steinkopff, Dresden and Leipzig, 1932.

Pocket Anatomy. C. H. Fagge, M.B., M.S., F.R.C.S., Ninth edition, 333 pages. Price $1.50. Baillière, Tindall & Cox, London, 1933.

Origin of Living Matter. H. A. Gray and N. M. Bligh. 26 pages. Price 1/6 net. W. Heffer & Sons, Cambridge, 1933.

A New Approach to Dietetic Therapy. Eugene Földes, M.D., Formerly Assistant Professor of Medicine, University of Budapest, Hungary. 434 pages. Price $5.00. R. G. Badger, The Gorham Press, Boston, 1933.